Technical Report 1130

Assessing Decision-Making Skills in Virtual Environments

Michael T. Gately and Sharon M. Watts
ScenPro, Inc.

Robert J. Pleban
U.S. Army Research Institute

June 2002

United States Army Research Institute for the Behavioral and Social Sciences

U.S. ARMY RESEARCH INSTITUTE

FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Directorate of the U.S. Total Army Personnel Command

ZITA M. SIMUTIS
Acting Director

Research accomplished under contract
for the Department of the Army

Technical Review by

Doug Parsons, STRICOM
Larry Meliza, ARI

REPORT DOCUMENTATION PAGE

1. Report Date (dd-mm-yy) June 2002	2. REPORT TYPE Final	3. DATES COVERED (from...to) January 2001 - January 2002
4. TITLE AND SUBTITLE Assessing Decision-Making Skills in Virtual Environments		5a. CONTRACT OR GRANT NUMBER DASW01-01-C-0013 5b. PROGRAM ELEMENT NUMBER 66502
6. AUTHOR(S) Michael T. Gately and Sharon M. Watts (ScenPro, Inc.) and Robert J. Pleban (U. S. Army Research Institute)		5c. PROJECT NUMBER M770 5d. TASK NUMBER 6901 5e. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) SenPro Inc. 101 W. Renner Road Suite130 Richardson, TX 75082		8. PREFORMING ORGANIZATION REPORT NUMBER SP-ARB01-2002-01F
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences ATTN: TAPC-ARI-IJ 5001 Eisenhower Avenue Alexandria, VA 22333-5600		10. MONITOR ACRONYM ARI 11. MONITOR REPORT NUMBER ARI Technical Report 1130

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
COR: Robert J. Pleban

14. ABSTRACT (*Maximum 200 words*):

Members of small dismounted units will face growing responsibilities and increasing challenges in combined arms combat and contingency operations on the battlefield of the future. Many of these missions will take place in urban settings. Training for military operations on urbanized terrain is limited by time, cost, and safety factors. Virtual environment technologies have the potential to provide the Army with a training capability to meet these new demands. An automated training and after action review support tool (Virtual Soldier Skills Assessor – ViSSA) is described. The ViSSA system will allow trainers to effectively assess soldier and small unit leader tactical and decision-making skills in virtual urban environments. The system tracks mission-related factors linked to soldier decisions, movements, fire, radio, traffic, and contact with virtual entities and trigger lines under an intricate web of overlays designed to capture and store these specific pieces of data during a training scenario. The system provides automated output displays for an effective after-action review following the virtual exercise.

15. SUBJECT TERMS Virtual Environment, Training System, Military Operations on Urbanized Terrain, Small Unit Leader, Decision-Making, After-Action Review, Assessment, Dismounted Infantry

SECURITY CLASSIFICATION OF			19. LIMITATION OF ABSTRACT	20. NUMBER OF PAGES	21. RESPONSIBLE PERSON (Name and Telephone Number)
16. REPORT	17. ABSTRACT	18. THIS PAGE			
Unclassified	Unclassified	Unclassified	Unlimited	84	Dr. Robert J. Pleban (706) 545-3617

Technical Report 1130

Assessing Decision-Making Skills in Virtual Environments

Michael T. Gately and Sharon M. Watts
ScenPro, Inc.

Robert J. Pleban
U.S. Army Research Institute

Infantry Forces Research Unit
Scott E. Graham, Chief

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

June2002

Army Project Number
DASW01-01-C-0013

Small Business Innovation Research

FOREWORD

Preparing soldiers and small unit leaders for future warfare will present many challenges for trainers due, in part, to the diversity of military missions ranging from humanitarian assistance and peacekeeping activities to high intensity conflict. Many of these missions will take place in urban settings requiring tactics, techniques, and procedures appropriate for urban environments.

Training for military operations on urbanized terrain at real world training sites is limited by time, cost, and safety factors. Simulation networking and virtual environment technologies have the potential to provide the Army with a supplemental training capability to meet these new demands.

This report describes the research, proof of concept, and design of the Virtual Soldier Skills Assessment System (ViSSA), an automated training and after action review support system. The ViSSA system will allow trainers to effectively assess soldier and small unit leader tactical and decision-making skills in virtual urban environments. The system tracks mission-related factors linked to soldier decisions, movements, fire, radio traffic, and contact with virtual entities and trigger lines under an intricate web of overlays designed to capture and store these specific pieces of data during a virtual training exercise. The system provides automated output displays for an effective after-action review following the virtual exercise.

This research was funded by the U.S. Army Research Institute for the Behavioral and Social Sciences as a Small Business Innovation Research Phase I award entitled *Assessing Decision-Making Skills in Virtual Environments*. Phase II work efforts will encompass actual development of the proposed ViSSA prototype.

MICHAEL G. RUMSEY
Acting Technical Director

ASSESSING DECISION-MAKING SKILLS IN VIRTUAL ENVIRONMENTS

EXECUTIVE SUMMARY

Research Requirement:

ScenPro, Inc. performed research for the development of an automated training, assessment, and after-action review support system to assist in preparing dismounted forces for special operations, stability and support operations, and contingency operations in urban environments.

The objectives of this Phase I Small Business Innovative Research work effort were threefold: 1) to identify the user requirements and potential mechanisms for capturing and assessing soldier decision-making skills in the virtual environment; 2) to develop a methodology to identify the key decision-points within a training scenario and directly relate the resulting action, behavior, or response to established mission objectives, rules of engagement, and commander's intent; and 3) to design an automated prototype system capable of accepting predefined assessment criteria from the Observer/Controller (O/C) during the staging of the scenario, and capturing both violations or strict adherence to these rules in order to provide valuable feedback to soldiers during the after-action review. For optimal effectiveness, the after-action review (AAR) tool must provide real-time monitoring of the events as they occur in the virtual environment in addition to immediate playback capabilities.

Procedure:

In order to accomplish these goals, subject matter experts (SMEs) in the areas of training, urban warfare, and legacy system operation were engaged and consulted throughout the Phase I effort. This user-driven approach provided the foundation for the development of a functional system design employing an expert/rule-based system of logic.

An important aspect of the Phase I effort was the creation of a library of five (5) training scenarios used for testing at the Land Warrior Test Bed (LWTB). The training scenario library was developed by SMEs, using U.S. Army training manuals and expertise in SWAT training and urban operations.

The training scenario library tests specific soldier skills at four (4) distinct levels of complexity. The training scenarios increase in complexity at each level, with Level 1 scenarios training fairly simple tasks and Level 4 providing the most complex and challenging tasks. The focused objectives should build on those skills mastered at the previous levels. The various levels provide a trainee with a sense of accomplishment, as they are able to master skills at each level and move on to the next challenge.

As the training scenarios were developed, the foundation for a training scenario development methodology was formulated. The methodology is consistent with a crawl, walk, run approach to training, but with a preemptive first step to ensure a common foundation for learning and a baseline for fair assessment of the training. The Level I introductory training allows the first-time user to simply get comfortable with the virtual environment technology, 3D visual display,

procedure and process to learn the very basic functionality and operation of the system prior to assessment. Virtual environments have a set of inherent limitations, such as time delays, artificial movement (including trackballs and treadmills), application-related limitations, and a lack of clutter. During our research effort, these limitations were investigated and their impact on assessment evaluated. Where possible, algorithms must be developed to remove these limitations from the assessment system.

A key objective of the Phase I effort, was to determine ways to capture, in software, the decision-making of a soldier in the virtual environment. The U.S. Army Simulation, Training and Instrumentation Command has developed a set of software modules and applications that construct distributed interactive simulation and computer generated forces applications. The OneSAF Testbed Baseline Version 1.0 has been developed specifically to provide a vehicle for integration, test and user feedback of technology developments for the objective system. OneSAF contains entities that are sufficiently realistic resulting in the "illusion" that the displayed vehicles and semi-automated forces are being maneuvered by human command, rather than computers. These entities, which include ground and air vehicles, individual combatants, missiles, and dynamic structures, can interact with each other and with manned individual entity simulators to support training, combat development experiments, and test or evaluation studies, on the virtual battlefield. A trade off study evaluated several of the most promising approaches:

Option 1: Create a set of entities, such as invisible walls, trigger lines, and exclusion zones, which can be encoded into the OneSAF overlays, dropped into the terrain, and will allow computer-automated analysis of the soldier's movements via their protocol data unit (PDU) traffic. However, the upper limit of the system appears to be about 40 entities, after that the system becomes overburdened.

Option 2: Modify OneSAF code to give the O/C a way to annotate a training scenario with evaluation criteria like 'best route,' 'could observe opposing forces ', and 'trigger lines'. This module would operate in real time and store pertinent information in a local database for use during the after-action review (AAR).

Option 3: Build a completely new software component that uses captured logged PDU traffic from the individual combatant simulator to assess the solder's performance. This component would perform its analysis after the exercise is completed delaying the AAR.

Findings:

The results of trade off studies provided evidence that the most effective approach would be **Option 2**, to modify the OneSAF software, using its overlays, control measures, and triggers, to capture and process the soldier decisions in real time. This approach will provide a fast, flexible system that will not limit the user to some arbitrary number of decision points. To ensure that the proposed approach could achieve required performance levels, experiments were conducted at the Land Warrior Test Bed in Ft. Benning, Georgia. The logger module in OneSAF was used to capture PDU traffic during execution of selected training scenarios. The logger module was invoked whenever a control measure trigger was fired causing an annotated timestamp to be written to a data file. A scenario involving 100 entities was used to stress the software module.

The results of the test proved that this approach could easily achieve the system's performance requirements.

Other key requirements noted by the domain experts included the need for a user-friendly interface, utilization of point and click technology, and the inclusion of graphics where appropriate. Incorporation of these features will allow the O/C to quickly and accurately monitor soldier decisions and provide meaningful feedback during the AAR.

Utilization of Findings:

Based on the Phase I research efforts, ScenPro was invited to submit a Phase II proposal. The Phase II was awarded and has been funded through the first year of the proposed two-year effort. The Virtual Soldier Skills Assessment (ViSSA) prototype system is designed to enhance the instructor's ability to train dismounted, small unit leaders (platoon, squad, and team) tactical and decision-making skills in virtual environments. The ViSSA system will provide a mature training scenario development methodology capable of producing a robust training scenario library and two software tools. The Scenario Authoring Tool will allow for the creation of new training scenarios, including the encoding of expert rules into the overlays and control measures for valid soldier assessment. An After-Action Review Tool will significantly reduce the burden on the trainer and assist in orchestrating an effective, multi-media AAR.

ASSESSING DECISION-MAKING SKILLS IN VIRTUAL ENVIRONMENTS

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

Page

LIST OF FIGURES

ASSESSING DECISION-MAKING SKILLS IN VIRTUAL ENVIRONMENTS

Introduction

Small Business Innovative Research (SBIR) Program

ScenPro, Inc. conducted research into the development of a Virtual Soldier Skills Assessment (ViSSA) system for the U.S. Army Research Institute, under the Department of Defense (DoD) Small Business Innovative Research (SBIR) program. The SBIR program is a set-aside program designed to support innovative research conducted by small business concerns that have the potential for commercialization resulting from the research subject. Innovation and the potential for commercialization are among the important factors included in the review criteria used in the scientific and technical merit evaluation process.

The SBIR program has three phases for product/process development with each phase contracted separately. During Phase I the small business performs research into the contract domain, develops a concept or approach to the problem, and determines the technical requirements and feasibility of the proposed concept. Based on the results of the Phase I effort, the firm is invited to submit a Phase II proposal to mature its concept. If the Phase II is awarded, the small business will generate a highly developed prototype product or process. The Phase III is supported by non-SBIR funds from the private sector and/or federal agencies that have a need for the product or process.

During Phase I of this SBIR project, we identified the most appropriate distributed interactive simulation (DIS) and high level architecture (HLA) environments to research and use for developing a methodology for an automated data collection and feedback system for training dismounted small unit leader (platoon, squad, and team) decision-making skills in virtual urban environments. We examined legacy systems and state of the art technology for opportunities to merge user requirements with expectations and conducted research into optimal data formats to support this heavily data-driven system development. This report provides the results of our research efforts and accomplishments.

Background

The U.S. Army Simulation, Training and Instrumentation Command (STRICOM) has developed a set of software modules and applications that construct DIS and computer generated forces (CGF) applications. The OneSAF Testbed Baseline Version 1.0 has been developed to provide a vehicle for integration, test and user feedback of technology developments for the objective system.

One SAF contains entities that are sufficiently realistic resulting in the "illusion" that the displayed vehicles and semi-automated forces (SAF) are being maneuvered by human command, rather than computers. These entities, which include ground and air vehicles, individual combatants (IC's), missiles, and dynamic structures, can interact with each other and with manned individual entity simulators to support training, combat development experiments, and test or evaluation studies, on the virtual battlefield.

In previous virtual environment (VE) research work funded by STRICOM, the design and software demonstration of the concept of an Automated Training Analysis and Feedback System (ATAFS) was developed to assist trainers in preparing after-action review (AAR) aids (Brown, Wilkinson, Nordyke, Hawkins, Robideaux, & Huyssoon, 1996; Brown, Wilkinson, Nordyke, Riede, Huyssoon, Aguilar, Wonsewitz & Meliza, 1997). While ATAFS concentrated on mounted platoons and is several generations behind OneSAF in software technology, it has a number of features (e.g., automated sets of questions for use during the after-action review that focus on key decision points captured during the virtual exercise) relevant to the dismounted small unit leader training assessment system requirements.

The Army has adopted the AAR process as the primary means of providing feedback after collective training exercises. The effectiveness of an AAR is dependent upon how well the observer/controller (O/C) or trainer can visually represent and organize data captured during the exercise to guide interactive discussions and recommendations for performance improvement.

An automated system for AAR preparation makes use of expert system rules to keep trainer requirements to a minimum and avoid distracting trainers from exercise control functions. The need to develop tools and procedures that can improve the quality of training scenarios and timeliness of feedback products for the AAR in DIS and HLA environments has driven the present research.

Purpose

The purpose of the Phase I effort was to develop a methodology for an automated data collection and feedback system for training small unit leader (platoon, squad, team) decision-making skills assessment in virtual urban environments. The ViSSA system is designed to accurately assess leader decision-making skills, and orchestrate an effective, multi-media AAR to effectively ease the burden on the O/C.

In the virtual environment, the O/C must often play the role of a higher command by monitoring and participating in the radio transmissions during the exercise. The O/C may also be required to perform a variety of exercise control functions including control of the semi-automated forces. These activities compete for the O/C's attention and the primary goal of performance evaluation. By allowing the O/C to predefine performance evaluation criteria, the system will automatically capture and rate soldier performance occurring during the virtual exercise for AAR, without interfering with necessary participation in the virtual exercise.

With the ViSSA system, soldiers may enhance their decision-making skills in a virtual urban training exercise at the Land Warrior Test Bed – LWTB (the virtual environment test site at Fort Benning, Georgia) to help reinforce the cognitive aspects of their training and to refine newly acquired skills. As soldiers participate in a tactical scenario using the McKenna military operations on urbanized terrain (MOUT) database – a three dimensional virtual rendering of the real world McKenna training facility at Fort Benning, they might also be receiving an introduction and preparation for a visit to the real McKenna training facility for additional or future training.

A library of training scenarios will focus attention on a variety of soldier skills. A soldier will enter the Soldier Visualization Station (SVS) and work as a team with other soldiers or with semi-automated forces supplied by OneSAF. The SVS is a specific type of individual combatant simulator used at the LWTB. During a scenario, the semi-automated forces may be pre-programmed to perform specific tasks or controlled by the O/C using the OneSAF user interface.

The ViSSA system will consist of a methodology and two software tools. The Training Scenario Development Methodology will be a structured approach for creating a scenario and capturing its salient features. The first tool will be an enhanced OneSAF system. The enhancements will allow the trainer to flag specific soldier behaviors or responses, as they occur during the virtual exercise, which might indicate good or poor decision-making skills. The second tool, the ViSSA AAR Toolset, will be a fully functional DIS module including a Stealth Viewer and will allow the O/C to rapidly focus in on key decision-making moments in the scenario or provide a full playback capability.

The system proposed in this document has the capability to record and store pertinent data captured during scenarios. Over time, this data could be used to generate statistics about areas where soldiers perform a skill particularly well or particularly poorly, the effectiveness of one training approach over another, or about pre-requisites for specific courses.

Approach

The approach used to identify specific ViSSA system functions employed the Scenario-based Engineering Process (SEP) developed by Harbison and McGraw (1997). This process, described in the following sections, provides a generic, structured approach for engineering the development of complex systems regardless of function.

SEP involves eliciting and compiling both normal and atypical scenarios of use. Scenarios of use are defined at the highest level of abstraction, as major processes, functions, or missions. The "AS IS (Current) and TO BE (Proposed)" scenarios of use provide a reference and bound the problem space for product development (Harbison & McGraw, 1997). They function as a before and after depicting the current situation and establishing expectation for the product delivery.

Phase I

Domain Analysis

The first step in developing the AS IS scenario of use is domain analysis. See Figure 1. The primary goal of domain analysis is to abstract the target domain to discover its primary concepts, attributes, and values. Domain analysis provides an enhanced understanding of the domain and a means to estimate knowledge acquisition needs and plans, and preliminary ideas for knowledge-based designs.

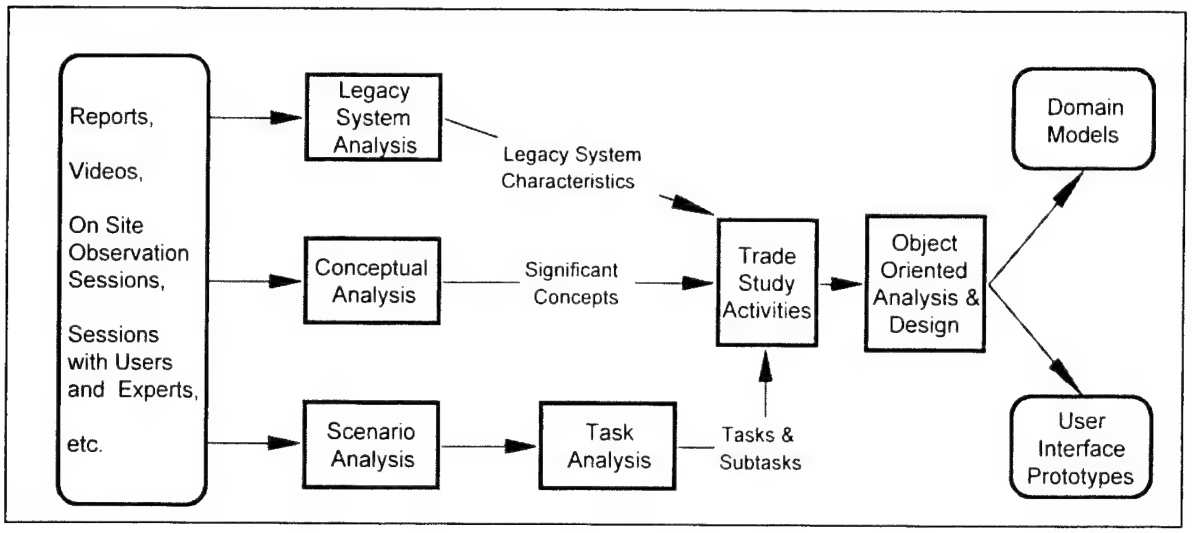


Figure 1. SEP domain analysis.

Specific knowledge acquisition sessions included a structured interview with an experienced Special Weapons and Tactics (SWAT) trainer and Firearms Training System (FATS) expert. SWAT training experts, on staff, with further expertise in the roles of knowledge analyst and application specialist were consulted and participated in every aspect of the research and development conducted during the Phase I effort.

ARI research reports on VE training were also reviewed for relevant background information (Pleban, Eakin, Salter, & Matthews, 2001). The Land Warrior Test Bed (LWTB) was made available for several visits to understand the system operation. The visits included consultations with system experts. They proved invaluable to understanding the system requirements, constraints, and development of the Scenario of Use for the end system design.

Legacy System Analysis

The LWTB consists of a dual personal computer (PC) control center and thirteen networked soldier visualization stations maintained for training research in virtual environments. The Soldier Visualization Station™ is a state-of-the-art, high fidelity, individual combatant, virtual simulation system. It provides 3D graphics, directional audio portals, and a screen projection user interface into the virtual environment (Pleban et al., 2001). A single soldier is "instrumented" by wearing a helmet with radio frequency sensors on it. He/she is equipped with a radio and simulation rifle that is networked to a control center computer. Detectors in the room determine the soldier's location and posture.

The ModSAF 5.0 software running at the LWTB was discontinued by STRICOM last year. To support research into the legacy system and avoid compatibility issues in the future, efforts to obtain its replacement, the OneSAF Testbed Baseline 1.0, were coordinated with updating of the LWTB system. In March 2001, the LWTB system was successfully updated to OneSAF Version 1.0.

The OneSAF software runs on one of the PCs in the control center. This PC is used by the O/C to stage the real and simulated entities and encode the control measures into the training scenarios. The OneSAF database contains a variety of digital terrains to choose from when creating a MOUT scenario. A second PC operates as a stealth viewer, allowing the O/C to view, take a snapshot, or analyze the simulation from any location in the virtual environment without affecting the outcome.

ScenPro investigated the use of the McKenna MOUT database and took an inventory of DIS objects, PDU messages, trigger lines, and overlay features that could be used to represent the various decision points and factors with enhancements to the source code. The McKenna database includes urban terrain with multi-elevated structures and an underground tunnel system. In trade-off studies evaluating the feature benefits of the digital terrains at our disposal, the McKenna MOUT database was determined to have all of the terrain characteristics required to conduct our research.

We investigated the purchase of Mäk Technologies VR-Link™ for development of the after-action review (AAR) tool, but determined that it was not required for Phase I Performance. During the Phase I option period, ScenPro evaluated the use of OTB as an alternative to MAK Technologies VR-Link™. We believe several of the OTB software products used together can provide an equivalent Graphical User Interface (GUI). The OTB Logger can be used to control AAR playback, OneSAF can be used to provide the Plan View, and a Stealth Viewer running concurrently and sharing the desktop should provide all of the information and functionality required for the AAR GUI display.

Conceptual Analysis

A conceptual analysis identified the key concepts associated with soldier training, assessment, and DIS/HLA simulations. The soldier experiences in the virtual world were identified, in addition to trainer requirements and a high-level description of the day-to-day use of the tool we are proposing to develop. A possible "To Be" Scenario of Use for the designed system includes the following steps:

1. Start OneSAF
2. Select the McKenna MOUT database
3. Create and save an Urban Terrorism Engagement Scenario
4. Identify locations of the following:
    a. Insertion point
    b. Goal/Desired End State
    c. Obstacles/Restricted Areas
    d. Blue/Gray/Red forces
5. Identify these additional features:
    a. Decision Points
    b. Optimal Route
    c. Environmental Cues
    d. Add and save assessment "objects"
    e. Tactical Factors

f. Command Rules
g. Teaming Rules
h. Rules of Engagement
i. Choose and save assessment factor weighting

6. Initiate Training Scenario
7. Start Soldier Visualization Station (SVS)
8. Start Assessment System
9. Trainee runs thru scenario
10. Assessment system captures and saves all assessment-based PDUs
11. Trainer can monitor the mission effectiveness of the soldier during the scenario with the assessment system
12. Stop OneSAF
13. Start AAR Tool
14. Provide comprehensive AAR to the training group
15. Print assessment results
16. Save assessment results for comparison with future performance

The most challenging work performed during the Phase I effort was to determine ways to capture, in software, the decisions of the soldier in the virtual environment. Trade off studies evaluated different approaches:

- Real time analysis versus post processing
- Active entities versus software monitoring
- OneSAF overlays, control measures, and triggers versus a separate analysis system

After performing several of these trade-off studies, we determined that the use of OneSAF overlays, control measures, and triggers were the most viable option for capturing soldier decision-making within the timeframe of a Phase II SBIR. This required a careful review of OneSAF Testbed Baseline (OTB) Version 1.0 software and documentation produced by STRICOM. The framework of existing software, user interface, simulation, and command and control architectures must be clearly understood in development of the Scenario Authoring Tool. The coding standards regarding library source files and programming style conventions were also reviewed for strict adherence in software modifications.

One SAF Testbed Baseline (OTB) Version 1.0. ScenPro compiled and studied the software architecture of the OneSAF Testbed Baseline (OTB) Version 1.0 and identified modules that could be modified to implement soldier tracking during a virtual exercise (Lockheed Martin Corporation, 2000a; Lockheed Martin Corporation, 2000b). A Linux Operating System was installed on both a Desktop PC and a laptop to run the software and mobilize it for experimentation at the LWTB. The approach would require modification of the Overlay/Control Measure/Trigger mechanism located in the following OneSAF Libraries:

- LIBETCM – Control Measures and Triggers
- LIBOVERLAY – Overlays

Additionally, the OneSAF module responsible for data communication between separate SIMNET modules would be modified to capture these data. The specific OneSAF Library is:

- LIBPDUPROC – Protocol Data Unit (PDU) to filter out specific PDU traffic

The specific PDUs applicable to evaluate soldier performance are:

- Entity_State_PDU
- Fire_PDU
- Detonation_PDU
- Collision_PDU

Some PDUs that may be evaluated for use in the future are:

- Message_PDU
- Action_Request_PDU
- Action_Response_PDU
- Transmitter_PDU
- Receiver_PDU
- Start_Resume_PDU
- Stop_Freeze_PDU

Automated Training And Feedback System (ATAFS). The Automated Training and Feedback System (ATAFS) was investigated (Brown et al., 1997). ATAFS employs an expert/rule-based system to automate selection of candidate AAR aids that the trainer may choose to use to make key teaching points during the AAR. ATAFS rules select particular AAR aids based upon trainee performance against a standard. The ATAFS concept provides the trainer the capability to observe the exercise in near-real time as the system prepares candidate AAR aids. The concept also provided the trainer with the capability to move back in exercise history as the system continues to collect data, prepare manual AAR aids, then return to a near-real time view of the tank platoon exercise.

Firearms Training System (FATS). The Firearms Training System (FATS) was researched for applicable approaches and features to consider for development of the proposed AAR tool. FATS is an interactive visual 'use-of-force' training simulator designed to assist trainers in teaching decision-making skills, use-of-force techniques and firearms accuracy. Police and military entities primarily use FATS to augment their existing 'use-of-force' and 'Close Quarter Combat' (CQC) training programs. FATS projects pre-recorded video images onto a large projection screen. The pre-recorded scenarios are video images of combatants in various urban environments. The combatants are engaged in varying degrees of reckless, dangerous, and offensive conduct. The displayed behavior of the combatants is designed to elicit a trainee's response. The trainee's response reflects his/her judgment on whether or not to use lethal force. A trainee confronts the projected image with the provided weapons module (Glock pistol

reproduction with laser mechanism) and fires at the combatant when tactically and legally appropriate.

Following a training exercise, a trainer replays the scenario on the projection screen and displays the captured responses for the trainee to view and assess. At the point lethal force is required, the reaction time counter appears on the screen and shows the time it took for the trainee to react (to shoot). In addition, each laser impact is displayed in green, yellow or red. Green is representative of a miss, yellow of a non-lethal hit and red as a lethal hit. A trainee's demonstrated skills (reaction time, accuracy) are documented, but are left to a trainer to assess.

FATS has, however, established a baseline for the appropriateness of the trainee's actions in regard to the use of lethal force. FATS records and displays the appropriateness of a trainee's use of lethal force in general terms of 'good judgment' or 'bad judgment'. 'Good judgment' is awarded to trainees who have successfully negotiated a scenario by demonstrating the appropriate response (example: shooting the correct target in the correct situation). Conversely 'bad judgment' is assigned to a trainee's performance when his/her responses are deemed inappropriate (example: shoot incorrect target or when no threat existed).

In the event that a trainee does not negotiate a scenario correctly (regarding judgment, reaction time, and accuracy), the trainer has the feedback necessary to determine the specific skill or ability that the trainee lacks or has had difficulty mastering. The trainer will either remove the trainee from the FATS simulation and focus specifically on the needed skill with other learning techniques or the trainer will require the trainee to participate in additional scenarios until the deficient ability or skills are mastered.

Scenario Analysis

ScenPro visited the LWTB to develop a comprehensive understanding of the OneSAF system. From these visits, ScenPro was able to document a scenario of use for the proposed system. A scenario of use identifies the details of the tasks, events, interactions, individual roles, and outcomes expected during a training exercise. Ultimately, it details how the scenario training and feedback system researched under this contract will benefit the user. During scenario analysis, user comments were solicited to validate and refine the scenario of use.

Research focused on the needs of three different user groups:

- U.S. Army trainers, who understand the skills required for successful leadership and require a scenario development methodology and a robust Scenario Authoring Tool to enable them to create a training scenario that will effectively stress the soldier's decision-making as they relate to specific skills.

- The O/C, who will interact with the OneSAF user interface to stage the scenario and effectively capture and annotate decisions points within the scenario where the soldier performed above or below the expected skill level.

- The trainee, who will be briefed about the mission prior to entering the virtual world and then provided with a comprehensive AAR. The AAR should include all participants as a team-building exercise, where they may learn from the mistakes of others and share in the glory of a successful mission.

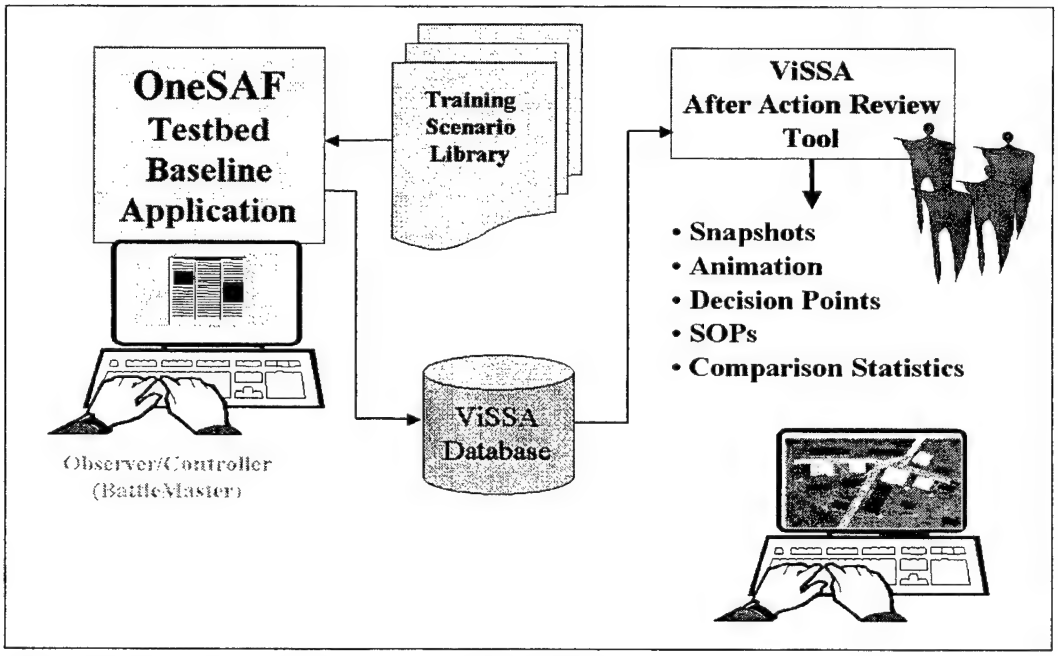


Figure 2. "To Be" scenario of use for the ViSSA system.

Training Scenario Development Methodology. Each soldier reporting for VE training and assessment should know what is expected "before" entering the simulator. This will ensure that the "training" atmosphere is maintained from start to finish of the virtual exercise. The following guidelines were developed by subject matter experts (SMEs) on the topic of training:

1. **Training Objectives** - Create and establish clearly defined training objectives. These objectives will help focus the training effort on required combat oriented abilities and provide a framework of understanding for the soldiers and trainers. Training objectives help establish goals for the student and a standard of measure for an acceptable level of performance by the trainer.

2. **Soldier Roles** - The role of each soldier should be clearly defined. This would mean that the machine gunner would have different or possibly additional duties from the point man on a patrol. However, they would also have some similar objectives by the very nature of the mission.

3. **Decision Points** - Leader decision-making is dynamic in MOUT. A soldier's senses are constantly bombarded with information in this very fluid environment. To compound this situation, the mission, rules of engagement, and commander's intent add variables and depth to every decision. The trainer should judiciously select

decision points that clearly illustrate violation or compliance and are relevant to the TLOs of the mission at hand.

4. **Captured Factors** - The assessment of decisions and their corresponding mission impact is essential to training and preparation of small unit leaders for such a fluid environment. In order to effectively critique decisions, the resulting actions must be captured and recorded for AAR and analysis. While our efforts attempt to map tactical and strategic decisions back to pre-scripted doctrine, we recognize that the most important factor to consider in decision assessment is the accurate capture and presentation of actions resulting from those decisions. Action is the '*fingerprint*' of thought.

   The trainee's actions will be noted and measured while engaged in the simulation. Factors associated with the navigation, radio communication, direct leadership, and weapons activity through the simulation will be noted. These factors will be categorized as a demonstration of the trainee's 'orientation' and 'judgment' and be representative of the trainees overall 'situation awareness' (SA).

5. **Displayed Factors** - The raw data captured during the virtual exercise is valuable by itself and analysis can provide insight into a trainee's thought processes. However, a comprehensive visual display of captured activities is critical to a constructive AAR. The data displays should be easy to use, understand, and flexible enough to allow the trainer to quickly filter through the large amount of peripheral data collected and focus on key points during the virtual exercise. The display should be intuitive and act as an extension of the trainer's abilities to observe and evaluate a trainee's activities.

6. **Assessment Process** - The trainer makes an assessment of a trainee's performance during the course of the scenario. The factors captured and displayed during the AAR should support the performance evaluation. In addition, the trainer's experience and understanding of the trainee's exposure to the tactics required to negotiate the scenario effectively will help establish a base line of performance for which the trainee's actions will be compared. Each of the factors presented should fluidly represent the product of the key 'decision points' within the scenario.

Army Leadership Training. The knowledge acquisition (KA) focused on the training and evaluation instruction block of the Primary Leadership Development Course (PLDC) offered at Ft. Leonard Wood, Missouri. ScenPro observed pertinent portions of the POI and reviewed support documentation. The observations included the training procedure, objectives, methods (classroom instruction, role-playing, exercises, etc.), and evaluation to capture and model the approved Army training and evaluation process.

The PLDC teaches basic leadership, NCO duties, responsibilities, authority, and how to conduct performance-oriented training. It focuses on leader training for the first level of the NCO. The course produces battle competent junior NCOs who are qualified team/section/squad

leaders, trainers of leaders and warfighting skills, evaluators, and counselors, conductors/ participants in individual and collective training, and performers/teachers of leader skills, knowledge, and attitudes.

The training block of instruction teaches the fundamentals and concepts of conducting training. It addresses programs, manuals, and techniques the Army uses to train soldiers to "perform to standard". It trains how to conduct performance-oriented training. It teaches how the AAR is used as a tool and discusses safety in training (U.S. Department of the Army, Course Management Plan - PLDC, 2001). There are three parts to the curriculum:

(1) Training the Force: Explains the Army's training doctrine and how leaders apply the doctrine to their units. Discusses Mission Essential Task List (METL) development, battle focus and the training management cycle. It outlines the requirements for training execution, the NCO's training responsibilities, and provides instruction on how to conduct individual training with emphasis on training the trainer. Students learn how to prepare and conduct individual training. Students must successfully demonstrate their ability to train soldiers in a field environment. Instructors provide an introduction to conducting collective training.

(2) After Action Review: Provides instruction on using the AAR as a training tool. It encourages soldiers to discover for themselves what happened during a training event. Students must conduct and participate in AARs throughout the course.

(3) Evaluations: Training the force evaluations are conducted when the students develop the training and are evaluated by the instructors. The evaluations are conducted outdoors near the barracks area.

The PLDC chief and four (4) small unit leaders who provide leadership training and evaluation were interviewed and observed. It is clear that certain leadership skills can only be trained in the classroom or in the field, however certain cognitive aspects of leadership training can be appropriately reinforced, supplemented, or trained more effectively using the flexibility and strengths of the virtual environment (Helms, Nissman, Kennedy, & Ryan-Jones, 1997).

Involvement from credible SMEs in the army training domain will not only be beneficial, but required for acceptance of the Training Scenario Development Methodology and automated assessment rules. Additionally, specific expertise in dismounted small unit leadership training in MOUT will be required.

Phase II

Application Analysis

When the results of domain analysis indicate that the best approach to solve a problem warrants software application development or enhancement, the process of application analysis begins. It involves the development of AS IS and TO BE system architecture diagrams and user interface designs and is the foundation of system-level prototype development.

A cardiologist would hardly begin a heart transplant without an understanding of human anatomy, the heart organ, and the circulatory system. Likewise, the systems engineer must comprehend the existing application architecture that embodies design decisions that will support capturing soldier actions, tracking mission related factors, and providing relevant summary statistics. Constraint analysis is a part of application analysis that identifies restrictions within the current system. Constraints related to interactions, timelines, coordination, and resources are all products of this analysis (Harbison & McGraw, 1997). Examples of constraints include specifications of the particular computer the system will run on and restrictions on objects in the digital terrain database.

The Land Warrior Test Bed (LWTB)

During the research effort, several opportunities were provided for experimentation in the LWTB facility. These experiments are described below.

Experiment 1. The purpose of this experiment was to provide an opportunity for SMEs to experience and experiment with the SVS technology and develop an understanding of its application and constraints as a training tool for dismounted, small unit leaders (platoon, squad, and team) in virtual urban environments. SMEs operated as an extraction team during both a day and nighttime version of a hostage scenario. The visit was very productive, providing the SMEs with a glimpse of the SVS training environment, operation, and a view from the trainee perspective.

The experiment facilitated development of the foundation for the Training Scenario Development Methodology and a test set of training scenarios based on U.S. Army training manuals research and SWAT training techniques.

Experiment 2. In this experiment, we conducted a knowledge acquisition session at the LWTB with system experts to evaluate the Training Scenario Development Methodology and format of training scenarios using the ***Training Mission – Search Building***. Key feedback was incorporated into the training scenarios.

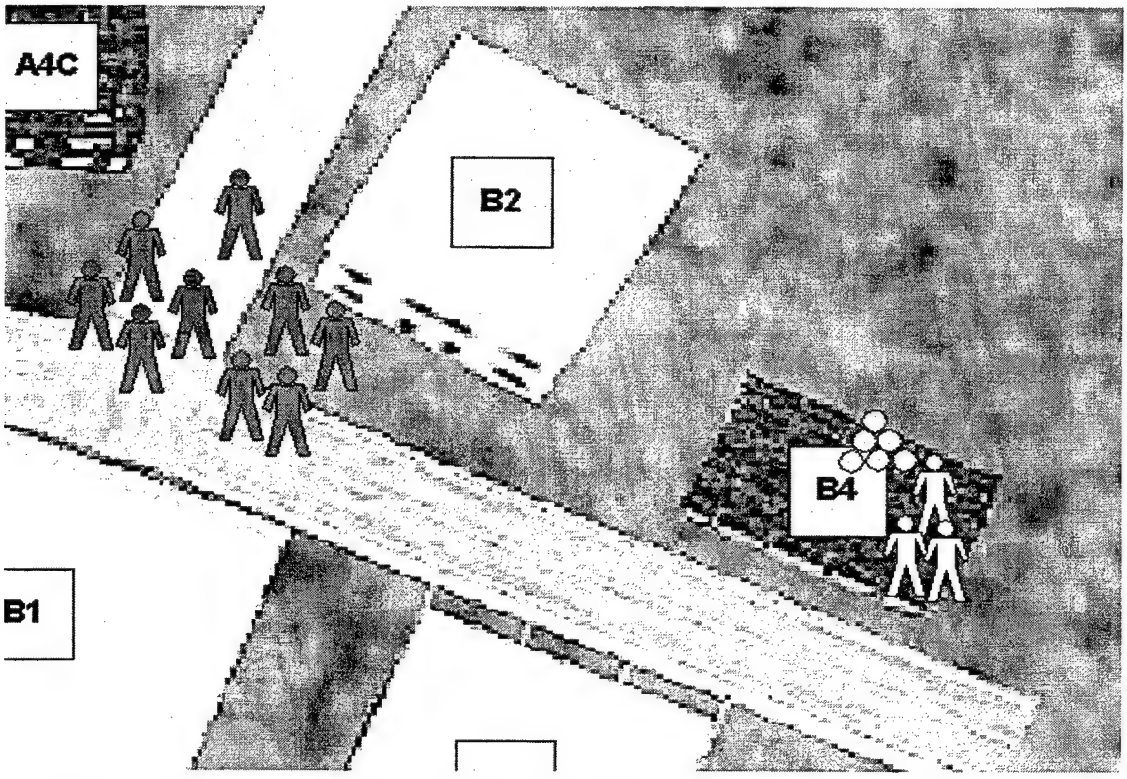


Figure 3. Training scenario illustration provided to the O/C for staging the scenario.

Experiment 3. For this experiment, we connected a laptop computer to the LWTB network, piloted the ***Training Mission – Hostage Rescue*** using a single SVS, and monitored PDU traffic during the experiment via the data logger. The laptop was running the OneSAF logger designed to capture decision-point PDUs to demonstrate proof of concept in capturing data from the data logger for soldier skills assessment and AAR.

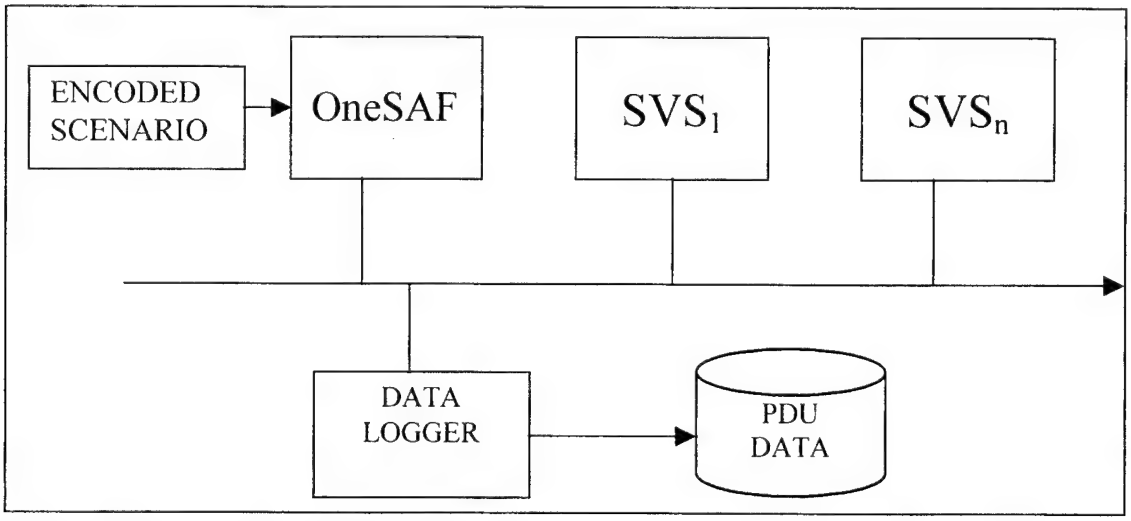


Figure 4. Visual representation of PDU logger experiment.

Results

During the Phase I effort, a library of five (5) training scenarios was developed for testing at the LWTB. The training scenarios were authored by SMEs using U.S. Army training manuals, (FM 90-10-1, An Infantryman's Guide to Modern Urban Combat, 1999) and background expertise in SWAT training and urban operations. These training scenarios were designed to test specific soldier skills at four distinct levels of complexity. The mission scenarios vary in detail and complexity and are categorized into four distinct levels. The levels include:

- Introductory/Level 1
- Basic/Level 2
- Intermediate/Level 3
- Advanced/Level 4

Each mission training scenario level contains a compilation of clearly defined elements. The elements are divided into two levels, primary and secondary. Primary elements structure the level of overall complexity of a scenario. Secondary elements define the operational constraints the leader will have to operate in and add depth to the experience.

Primary Elements include:

- Use of Force
- External/Environmental Distractions
- Time Constraints
- Personnel Management

Secondary Elements Include:

- Detailed Mission Preparation
- Number of Objectives
- Number of Tasks Requiring Management
- Task Cues Before or During Operations

These elements applied separately or combined with other elements, create a unique set of challenges for the small unit leader to address and overcome. Primary elements attempt to create opportunities for direct leadership and decision-making. Scenarios containing a greater number of primary elements are classified as Advanced/Level 4, while scenarios containing one primary element are classified as Introductory/Level 1.

The incorporation of secondary elements supports the graduation of scenario complexity from Basic/Level 2 to Advanced/Level 4. In addition, the inclusion of varying degrees of complex or demanding secondary elements increases the level of training cadre involvement and overall length of the simulation. The scenarios developed are:

- Level 1 Training Mission, Patrol

- Level 2 Training Mission, Injured Soldier
- Level 2 Training Mission, Search Building
- Level 3 Training Mission, Sniper
- Level 4 Training Mission, Hostage Rescue

As the training scenarios were developed, the foundation for a Training Scenario Development Methodology was formulated. The expert feedback received during staging of the scenarios at the LWTB was incorporated into final training scenario deliverables for this Phase I contract, with opportunities for further research. These opportunities include research into the separation of terminal and enabling learning objectives and an in-depth study of specific constraints of the OneSAF software for training. Identification of these constraints could help provide valuable feedback to STRICOM for future enhancements to the OneSAF software.

The methodology is incorporated into the training and learning objective, procedure, and diagrams developed to assist the O/C when staging and encoding the control measures in the OneSAF virtual world. A scenario developed using the methodology will result in the creation of these products:

- A training scenario outline and briefing procedure for administration by the O/C to the small unit leader prior to initiating the virtual training exercise (including specific actions the O/C must perform during the exercise).

- An OPORD to provide situational awareness, mission details, and background information to the small unit leader in preparation for entry into the virtual world.

- An encoded OneSAF training scenario file containing the simulated entities, various overlays, control measures, triggers, rules, and question sets used by the ViSSA analysis module to assess the soldier's performance and direct the after-action review.

Domain/Application Analysis

Based on the findings from the domain and application analyses, we determined that the methodology for the development of a system which will track mission-related factors linked to soldier decisions, capture and store information from the trainer about response alternatives, permit rapid replay of events at scenario decision points, and provide a top-down snap shot view of the simulation could be accomplished in three ways:

Option one involves the creation a set of entities, such as invisible walls, trigger lines, and exclusion zones, which can be encoded into the OneSAF overlays, dropped into the terrain, and will allow computer-automated analysis of the soldier's movements via their PDU traffic. However, the upper limit of the system appears to be about 40 entities, after that the system becomes overburdened.

Option two would involve modifying the OneSAF overlay code to give the O/C a way to annotate a training scenario with evaluation criteria like 'best route,' 'could observe Opposing

Forces (OPFOR)', and 'trigger lines'. This module would operate in real time and store pertinent information in a local database for use during the AAR.

Finally, option three would involve building a completely new software component that uses captured PDU traffic from the SVS to assess the solder's performance. This component would perform its analysis after the exercise is completed delaying the AAR by the amount of time required for post-processing.

OneSAF Testbed Baseline (OTB) Version 1.0

The trade off studies showed that the most effective approach was Option 2, to modify the OTB software, using its overlays, control measures, and triggers, to capture and process the soldier decisions in real time. This approach will provide a fast, flexible system that will not limit the user to some arbitrary number of decision points. Also, the real-time AAR capabilities will be immediately accessible while the events of the exercise are still fresh in the minds of the soldiers.

The key development constraints that have been identified using this approach are:

1. The ViSSA system must work with the SVS.
2. The LWTB is currently running OneSAF on PCs operating in a Linux environment.
3. Assumptions about a soldier's decision-making skills must be drawn primarily from his/her actions. Specifically, the direction they choose to walk, what posture they use, how quickly they react, where they fire, and how they direct their squad or teams to respond.
4. The soldier's squad may be human beings assigned to a specific role in the SVS, or they might be Semi-Automated Forces (SAF) soldiers operating under control of the O/C.

The OTBSAF system architecture consists of C libraries. The libraries contain strictly defined interfaces and are layered so that they depend on lower-level libraries only (Lockheed Martin Corporation, 2000a; Lockheed Martin, 2000b). A developer with the appropriate knowledge and a OneSAF distribution agreement from STRICOM, PM OneSAF can extend the system by replacing or adding new libraries or include library files as components in one's own system. However, it is important to note that OTB code cannot be redistributed without permission.

The OneSAF software package is currently being maintained by STRICOM. All changes, upgrades, and development efforts are submitted to that organization for review and possible inclusion in the next software baseline. It is our intent to adhere to the STRICOM software development process for any code changes we make to OneSAF. This will give us the opportunity, if appropriate, to include our enhancements to the overlay and trigger libraries, as well as our ViSSA Analysis Module, in a future OneSAF release.

The specific OneSAF software modules requiring modification to develop an automated capture and feedback system have been identified along with the observable,

computable, and inferable actions that might be used to quantify the soldier's application of the skill being assessed during the scenario using appropriate control measures.

The software modifications would require the trainer or O/C to complete the following steps to run a new training scenario:

Step1: Use OneSAF in the traditional way to stage the training scenario. This includes selecting a digital terrain and populating the terrain with semi-automated forces. Next, the trainer or O/C would use the overlays, control measures, and trigger lines to encode the assessment criteria into the scenario. Finally, the expert system rules and question sets are composed and stored into the scenario file.

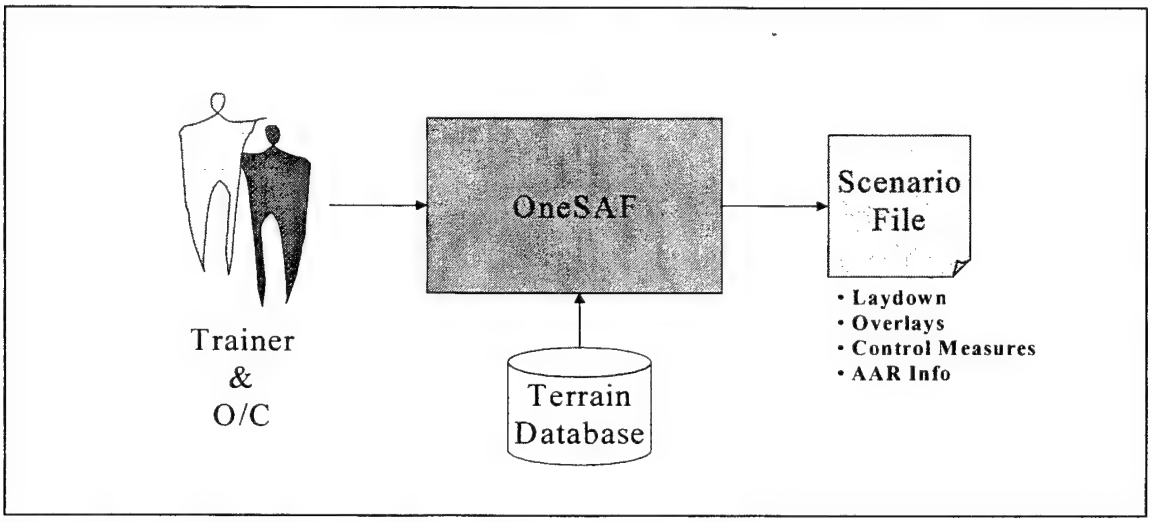


Figure 5. Step 1 – training scenario creation using OneSAF.

Step 2: When one or more soldiers need specific skill training, the O/C will initialize OneSAF and the SVSs using the stored scenario. The O/C will brief the soldiers and provide the appropriate training scenario, visual aides, and/or OPORD. During the exercise, OneSAF will monitor the soldier movement and capture key decision points, saving them to the ViSSA database. Additionally, the PDU traffic generated during the scenario will be logged.

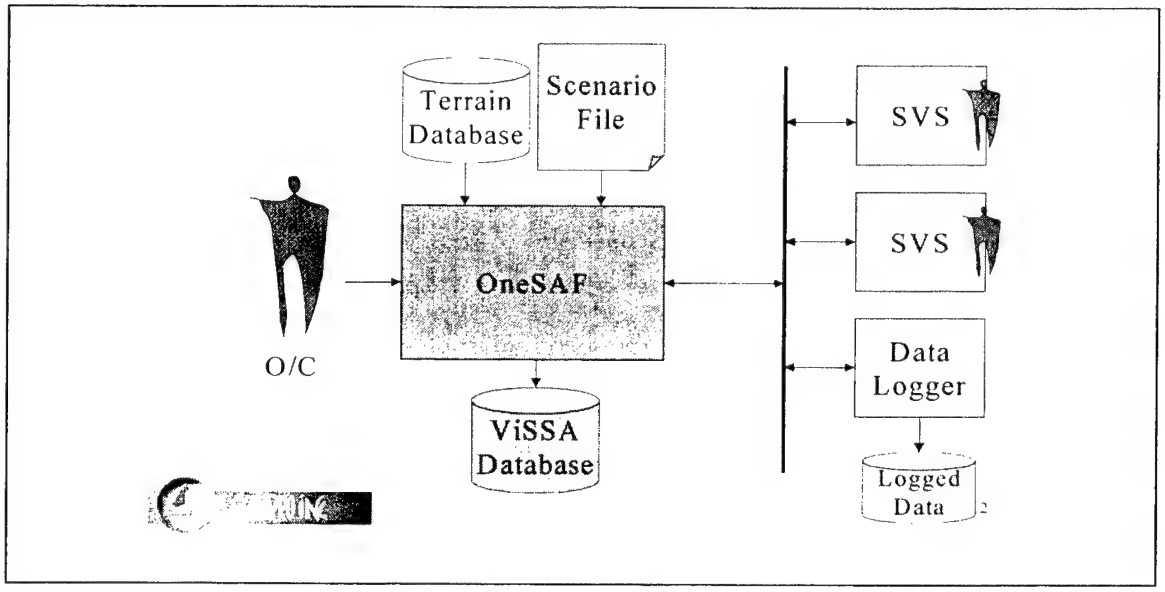


Figure 6. Step 2 – training scenario use.

Step 3: After the exercise is completed, the O/C, possibly with the help of a trainer, will start the ViSSA AAR Tool. The tool will highlight key decision points captured during the training exercise. The trainer will prompt the soldier(s) for a personal assessment of their behavior. Then, the trainer will use the AAR Tool to support his own evaluation, replaying examples of good and poor decision-making. The AAR Tool will provide an appropriate set of 'Socratic' questions stored during scenario creation. The questions will be a subset, obtained from a master list, called in response to a specific violation.

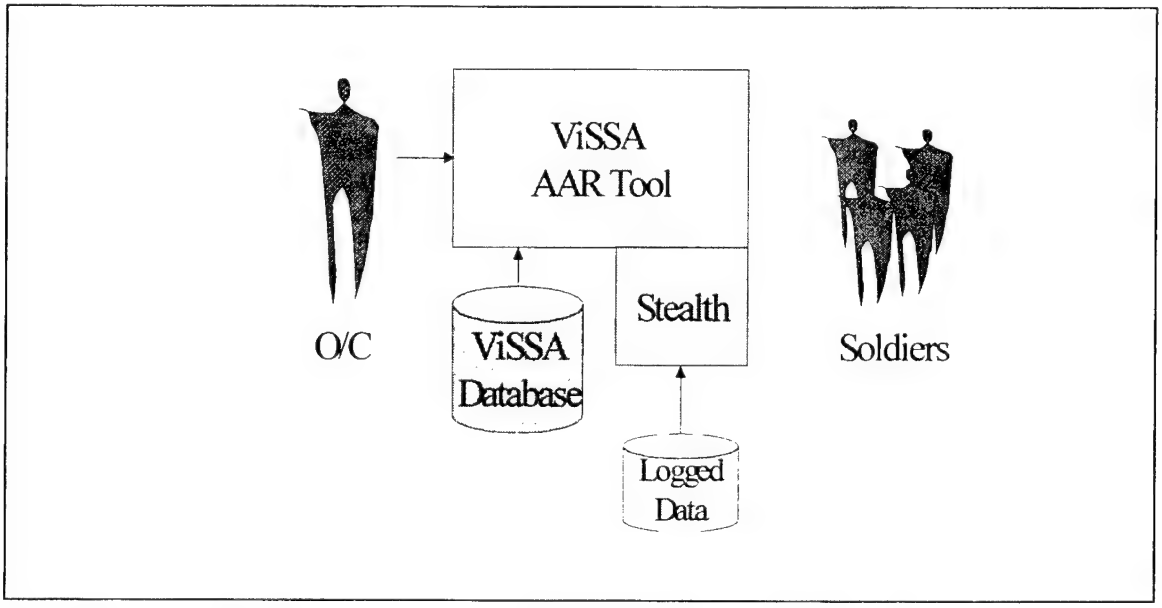


Figure 7. Step 3 – after action review.

Captured Factors

In order to assess soldier decision-making skills in the virtual environment, we must monitor behaviors. Although we are primarily interested in evaluating the performance of the squad or platoon leader - who will be directing the other soldiers, we cannot rely only on following the progress of one entity, but must watch how all participants synchronize their efforts as a team toward a common goal. The most direct indications of behavior come from the PDU traffic that is generated by the SVS. The PDUs and their associated behaviors include:

- entity_state_PDU
  - location
  - orientation/posture
  - weapon state
  - heading
  - speed
- fire_PDU
  - weapons fire
  - weapons accuracy
- collision_PDU
  - colliding with another entity
  - touching a building or tree (such as for concealment)

Beyond this direct observation, there are a number of soldier behaviors that can be computed using simple mathematics and geometry. These may include:

- Time (total, phases, in zones, etc)
- Reaction time (using physical or verbal responses)
- Soldier health (with respect to collisions, fires, and detonations)
- Use of cover and concealment (including posture)
- Distance off route
- Observations (when one entity is within line-of-sight of another)
- Employment of resources

It is also possible to infer soldier decision-making by monitoring the actions of the soldier's team (assuming they are following the direction of the leader). Some of the behaviors that can be inferred using this technique include:

- split/joined teams
- flanking/encircling actions
- take up defensive positions

Together, these behaviors provide a broad understanding of the soldier's thought process.

Conclusions

The Virtual Soldier Skills Assessor (ViSSA) system will enhance the U.S. Army's ability to train decision-making skills to dismounted, small unit leaders (platoon, squad, and team) in virtual environments. ViSSA will provide an automated data collection and feedback system designed to accurately assess a small unit leader's decision-making skills, and orchestrate an effective, multi-media, after-action review. In the submitted SBIR Phase II proposal, we recommend the following approach to developing the ViSSA system.

The completed ViSSA system will consist of a methodology and two software tools. The Training Scenario Development Methodology will be a structured approach for creating a scenario and capturing its salient features. The first tool will be an enhanced OneSAF system. The enhancements will allow the trainer to annotate a scenario with decision point criteria and to flag specific soldier behaviors or responses as they occur during the virtual exercise. These might indicate, for example, either good or poor decision-making skills. The second tool, the ViSSA AAR Toolset, will be a fully functional DIS/HLA module, including a Stealth Viewer, and will allow the O/C to rapidly focus in on key decision-making moments in the scenario or provide a full playback capability.

Training Scenario Development Methodology

The foundation established for the Training Scenario Development Methodology needs further work for completion. Consultation with experts in simulated systems for training in concert with participation and observation during ARI virtual environment experimentation conducted at the LWTB should provide additional feedback for finalizing the methodology.

Scenario Authoring Tool

We recommend modification of existing OneSAF code to provide the O/C with a cost-effective Training Scenario Authoring Tool to specify the soldier decisions, actions, and behaviors that demonstrate mastery of the predetermined training and learning objectives.

OneSAF currently allows a user to define and store a scenario composed of a terrain, any number of entities (including both vehicles and dismounted infantry), and orders for each entity (including O/C commands and actions in response to other entity behaviors) [Lockheed Martin Corporation, 1998]. Development of the ViSSA Scenario Authoring Module will constitute a set of enhancements to the OneSAF user interface and the current overlay and control measure modules. The enhancements will allow the trainer and O/C, following the Scenario Development Methodology, to easily enter the additional information needed by ViSSA to assess soldier decision-making skills.

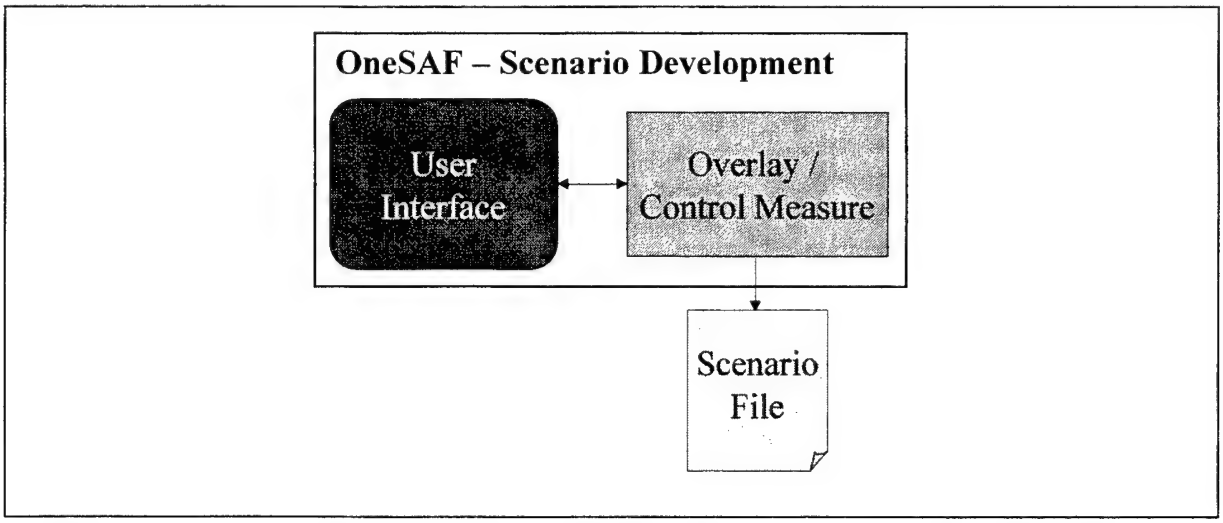


Figure 8. OneSAF scenario development components.

The Scenario Authoring Module will use rules to define the various expectations and constraints that will be used to assess the platoon leader skills. For example, on one overlay, polygon control measures will be used to indicate areas where the enemy has established clear fire superiority (kill zone). When an entity crosses into or out of this zone, a software trigger will examine all of the associated rules. A rule appropriate for this situation might be:

IF the SVS_Soldier is within the KillZone
THEN Mark Timeline with (Timestamp,KillZone, KillZone QuestionSet, PlanView)
AND Modify SVS_Soldier Score (CoverAndConcealment, -5)

An integrated set of overlays, control measures, triggers, and rules will be developed for ViSSA. Some of the different aspects of soldier behavior that will be monitored using this technology include:

- Routes
- Situational Awareness/Effective use of Communications
- Inclusion/Exclusion Zones
- Timelines/Phases/Deadlines/ /Maximum Response Times
- Use of Environmental Cues
- Team Control
- Effective use of Individuals
- Safety and Security
- Kills (enemy, neutral, civilian, BLUFOR)
- Weapon accuracy
- Response to threat

The overlays, control measures, triggers, rules, and the associated questions will be saved in the scenario file, then loaded and made available to the ViSSA Analysis Module

during scenario execution. The user might have a performance checklist of predefined behaviors that satisfactorily demonstrate mastery and might be asked to weight each (so the sum is 100%) according to their appropriateness for the given scenario.

After-Action Review Tool

The after-action review (AAR) discussions are facilitated by data displays that illustrate critical decision-points within the scenario, the expected response, and the actual response as it was captured during the network simulation.

Automated support of behavioral observations. The system will analyze the PDU traffic to decide when predefined events are occurring that require action on the part of the trainee (e.g., a unit is approaching a danger area). The system will automatically cue the trainer when there is a trainee response (or lack of response) to be observed, and it will display relevant criteria for assessing performance. The system will automatically store the results of any assessments of the trainee response, along with a time-tag. The system will also cue the trainer when to perform certain exercise control functions that will cue a response from the trainee (e.g., provide new information on the enemy situation while playing the role of a higher headquarters.)

Automatic playback of the exercise from logged PDU data. The system will provide a full playback capability to illustrate the tactical situation that should have elicited a response from the trainee, and it will mark the time line with an appropriate positive or negative outcomes of a decision made by the trainee (e.g., show how the unit was destroyed by direct fire when the trainee allowed it to cross a danger area in the wrong way).

Tailor the system to support specific exercises. While a trainer (or training scenario developer) is using OneSAF to author an exercise scenario, the system will allow him or her to specify the events that should trigger a response from the trainee (and the software will determine exactly when the events occur), identify the event to be observed and assessed, and identify any criteria for assessing the trainee response. The system will also allow a trainer to specify non-PDU events that require a response from the trainee (e.g., the trainer will play the role of a higher headquarters and provide an order that should elicit a response from the trainee). As in the case of PDU data, the system will allow the trainer to specify the event to be observed and criteria for assessing the performance.

A decision point describes the moment within a virtual training exercise when the soldier must make a decision. It does not necessarily relate to a specific point in space (such as certain doorway). It does not necessarily correspond to a specific point in time (such as 10:37 after the squad debarks from the helicopter). It may mean these things, but it is important to consider that decision points occur for many reasons—and that a single decision point within a particular scenario may occur in a different place and time each time the training scenario is executed.

During scenario analysis, notional and conceptual designs for the graphical user interface were presented to SMEs for analysis and feedback. The feedback included requests for specific types of display options available to support after-action reviews. These include:

- Top-Down Plan View
- Animated Top-Down Plan View (observe the scenario unfold)
- Snap Shots (a set of stationary views into the scenario that capture critical decision-making moments)
- Audio Capture/Playback
- Statistical Tables and Graphs (fire data, kills, mission completion time, time in specific zones, etc.)

Current discussions regarding the AAR tool architecture envision the use of two computers. One computer will host and display the AAR tool playback controls and performance results, while the other runs the selected playback from the logger. The performance assessment will be modeled after field training exercise (FTX) performance assessment procedures conducted at the Primary Leadership Development Course at Ft. Leonard Wood. The system will provide confidentiality of individual soldier performance from the group, identification of areas of mastery and weakness, and a summary of the soldier's overall performance for future reference. Army leadership training assessments incorporate a "GO" or "NO GO" policy. The soldier must perform all expected tasks to receive an overall "GO" upon completion of the training.

The plan or stealth viewer playback will be displayed from the second computer. We believe the AAR will be more effective if screen real estate is maximized for soldiers viewing the simulation. There will also be less interruption during the AAR if the trainer can control displays via a separate screen.

The user interface is the only portion of the application actually visible to the user when development is complete. It should be intuitive to operate, clear and concise in the information it provides, and visually appealing to the user. Figures 9 and 10 provide a conceptual interface design for the AAR tool.

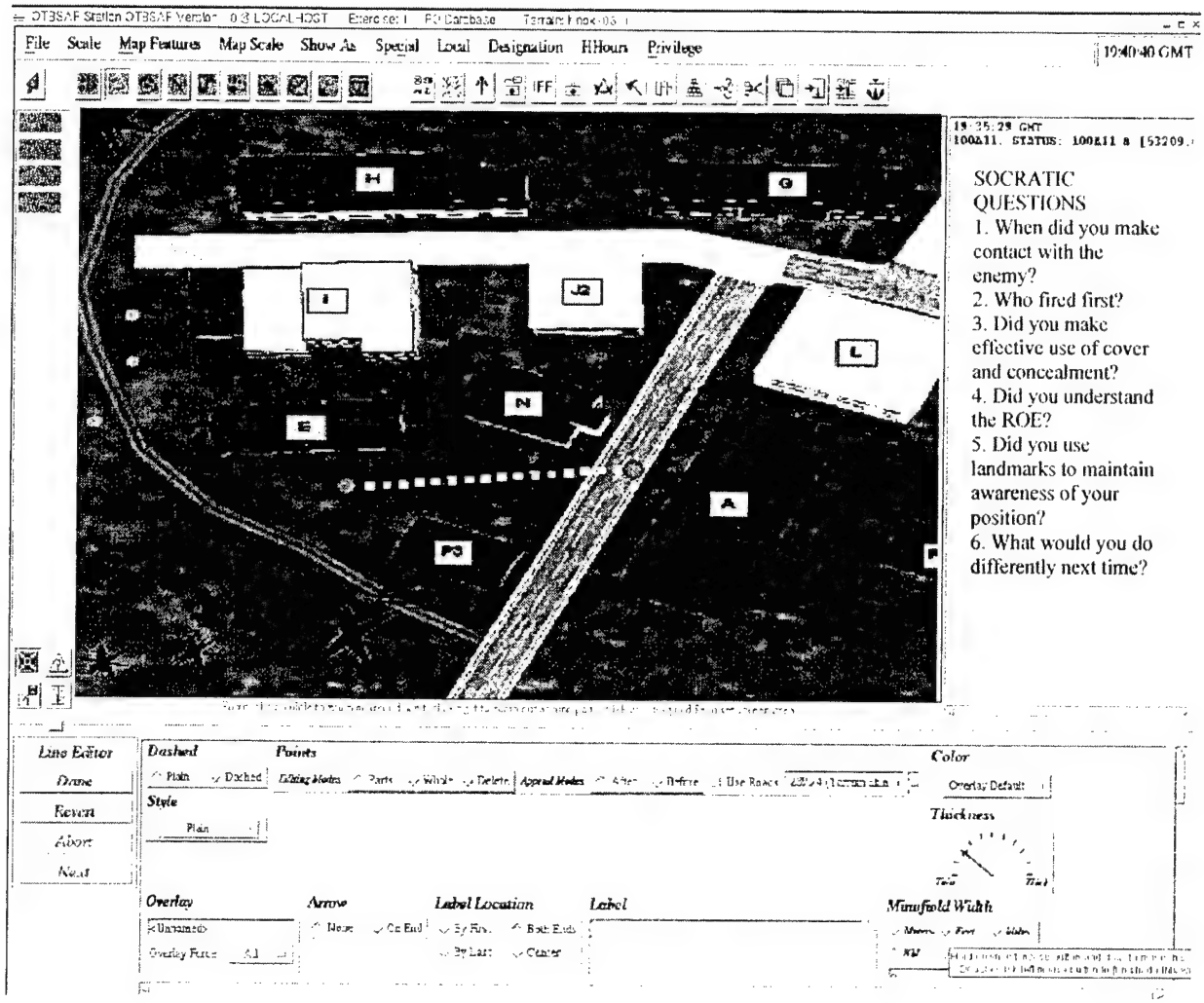


Figure 9. Conceptual AAR GUI display – OneSAF plan view.

The After Action Review Tool will allow for long-term storage and statistical analysis, and must also provide a print capability. The team performance summary will be provided in a standardized hard-copy format for the squad leader to keep following the virtual training exercise.

The system proposed in this document has the capability to record and store pertinent data captured during scenarios. Over time, this data could be used to generate statistics about areas where soldiers perform a skill particularly well or particularly poorly, the effectiveness of one training approach over another, or about pre-requisites for specific courses.

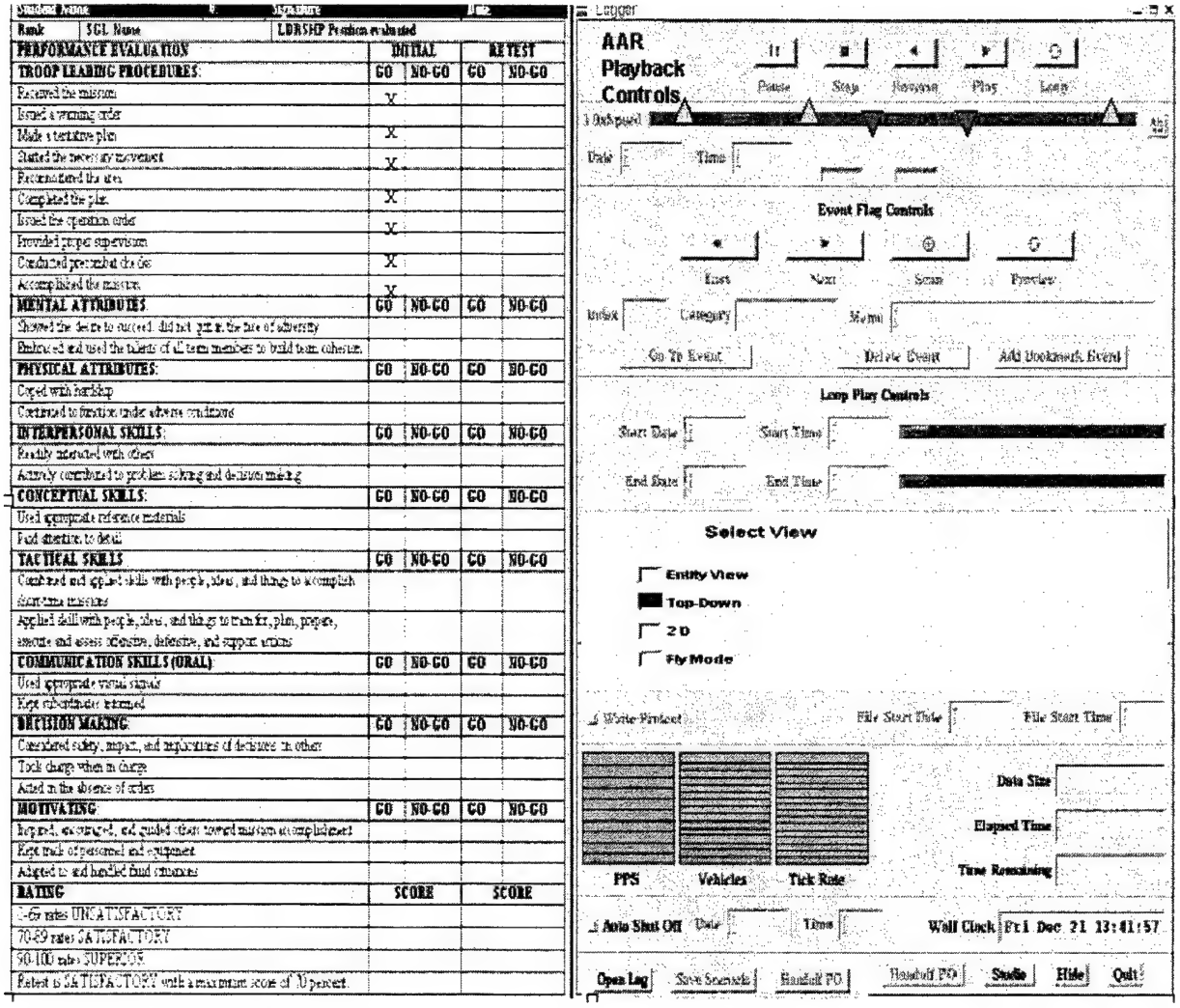


Figure 10. Conceptual AAR GUI display – modified OTB logger interface.

Speech Recognition

During our investigation into the types of data to capture and analyze for small unit team leader decision-making it became clear that for every decision revealed through a soldier's actions, there were an equal number of decisions revealed only through radio communications. Thus, to fully assess a soldier's decision-making skills, it may be necessary to go beyond capturing the soldier's actions (which is made easy by the very nature of SIMNET), and capture, convert, and understand the important role of verbal communication during mission execution. What a leader says or does not say may provide valuable information concerning his decision-making and leadership skills.

Speech recognition is still a difficult problem that remains even after decades of research. We cannot suppose to solve this problem, particularly in the scope of a SBIR. However, we have identified several possible solutions. First, for the Phase II effort, we propose to evaluate state-of-the-art technology in speech recognition and comprehension. We will determine if there are any viable solutions that can be integrated – most likely using a restricted grammar. Second, we will investigate the possibility of the O/C manually indicating

when the soldier made an appropriate verbal request/command. Third, we will identify actions (that can be captured in OneSAF) that would only result from team leader commands - such as a fire team splitting off or rejoining the group, or the clearing of a building.

The proposed ViSSA system will make the most of current technology available at the LWTB and provide a comprehensive assessment of soldier and small unit leader behavior in an efficient, cost effective way, while greatly easing the burden on the trainer.

References

Brown, B., Wilkinson, S., Nordyke, J., Hawkins, R, Robideaux, B., & Huyssoon, S. (1996). Demonstrating the concept of an automated training analysis and feedback system (Technical Report No.1043). Alexandria, VA: United States Army Research Institute for the Behavioral and Social Sciences.

Brown, B., Wilkinson, S., Nordyke, J., Riede, D., Huyssoon, S., Aguilar, D., Wonsewitz, R., & Meliza, L. (1997). Developing an automated training analysis and feedback system for tank platoons (Technical Report No.1708). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Harbison, K., & McGraw, K. (1997). User-centered requirements: The scenario-based engineering process. Mahwah, NJ: Lawrence Erlbaum

Helms, R.F., Nissman, D.B., Kennedy, J.F., & Ryan-Jones, D.L. (1997). Virtual environment technology for MOUT training (Report No. NPRDC-TN-97-10). San Diego, CA: Navy Personnel Research and Development Center.

Lockheed Martin Corporation (1998). Dismounted warrior network enhancements for restricted terrain - DISAF MOUT enhancements (Delivery Order No. 0055, CDRL AB02). Orlando, FL: Author.

Lockheed Martin Corporation (2000a). OneSAF testbed baseline - version 1.0 installation procedures (Delivery Order No. 0097 CDRL AB04). Orlando, FL: Author.

Lockheed Martin Corporation (2000b). OneSAF testbed baseline - version 1.0 release notes Orlando, FL: Author.

Pleban, R.J., Eakin, D.E., Salter, M.S., & Matthews, M.D. (2001). Training and assessment of decision-making skills in virtual environments (Research Report No. 1767) Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

U.S. Department of the Army (1999). An infantryman's guide to modern urban combat (FM 90-10-1). Washington, DC: Author.

U.S. Department of the Army (2001). Course management plan (CMP) PLDC. Washington, DC: Author.

Bibliography

Lockheed Martin Corporation (1997a). Dismounted infantry semi-automated forces analysis (Delivery Order 0020, CDRL AB02). Orlando, FL: Author.

Lockheed Martin Corporation (1997b). Dismounted infantry semi-automated forces final report (Delivery Order 0020, CDRL AB03). Orlando, FL: Author.

U.S. Department of the Army (1992). Soldier's manual of common tasks skill level 2-4 (STP21-24). Washington, DC: Author.

U.S. Department of the Army (1994). Mission training plan for the infantry rifle platoon and squad (ARTEP 7-8-MTP). Washington, DC: Author.

U.S. Department of the Army (1994). Soldier's manual of common tasks skill level 1 (STP21-1). Washington, DC: Author.

U.S. Department of the Army (2001). The army training system primary leadership development course (TATS-PLDC) program of instruction. Washington, DC: Author.

U.S. Marine Corps (1999). Project Metropolis: Phase I after action report - the combined arms combat team in MOUT. Quantico, Virginia: Marine Corps Warfighting Laboratory.

Appendix A

Acronym List

AAR	After-Action Review
ARI	Army Research Institute
ATAFS	Automated Training Analysis and Feedback System
ADT	Active Duty for Training
ATAS	Automated Training Application System
BLUFOR	Blue Forces
CBI	Computer-based Instruction
CDO	Conduct Defensive/Offensive Operations
CMP	Course Management Plan
DA	Department of the Army
DIS	Distributed Interactive Simulation
DISAF	Dismounted Infantry Semi-Automated Forces
DMSO	Defense Modeling and Simulation Office
DOES	Directorate of Evaluation and Standardization
DOTD	Directorate of Training and Doctrine
ELO	Enabling Learning Objective
FM	Field Manual
FOM	Federate Object Model
FRAGO	Fragmentary Order
FTX	Field Training Exercise
HLA	High Level Architecture
IDT	Inactive Duty for Training
IOBC	Infantry Officers Basic Course
ITC	Instructor Training Course
KA	Knowledge Acquisition
LWTB	Land Warrior Test Bed
LS/A	Learning Step/Activity
METL	Mission Essential Task List
METT-T	Mission, Enemy, Terrain, Troops and Time (Planning model)
ModSAF	Modular Semi-Automated Forces
MOUT	Military Operations on Urbanized Terrain
NBC	Nuclear, Biological, and Chemical
NCO	Noncommissioned Officer
NCOA	Noncommissioned Officer Academy
NCOES	Noncommissioned Officer Education System
O/C	Observer/Controller
OCOKA	Observation, Cover, Obstacles, Key Terrain and Avenues
OMT	Object Model Template
OneSAF	One Semi-Automated Forces
OPFOR	Opposing Forces
OPORD	Operations Order
OTB	OneSAF Testbed Baseline

PE	Practical Exercise
PDU	Protocol Data Unit
PIU	Protocol Interface Unit
PLDC	Primary Leadership Development Course
POC	Point of Contact
POI	Program of Instruction
REF	Reference
ROE	Rules of Engagement
RTI	Runtime Infrastructure
SAF	Semi-Automated Forces
SASO	Stability and Support Operations
SBIR	Small Business Innovative Research
SGI	Small Group Instruction
SGL	Small Group Leader
SIMNET	Simulation Networking
SME	Subject Matter Expert
STRICOM	Simulation, Training and Instrumentation Command
SVS	Soldier Visualization Station
SWAT	Special Weapons And Tactics
TASS	The Army School System
TATS	The Army Training System
TLO	Terminal Learning Objective
TSP	Training Support Package
VA	Visual Aid
ViSSA	Virtual Soldier Skills Assessment

Appendix B

Domain Dictionary

Accreditation
The recognition afforded an educational institution when it has met accepted standards of quality applied by an accepted, professional accreditation agency.

Administrative drop
The removal of a student from a formal training program for reasons other than failure to meet minimal academic standards.

After-action review/report (AAR)
A professional discussion of an event focused on performance standards, that enable soldiers to discover for themselves what happened, why it happened, and how to sustain strengths and improve on weaknesses. It is a tool leaders, instructors, and units can use to get maximum benefit from every mission or task.

Army Training Requirements and Resource System (ATRRS)
The Army training management system. It projects inputs, resource requirements, and student accountability, and updates military personnel training records. It provides the data for Congressional Military Manpower Training Reports (MMTR), etc.

Automated Systems Approach to Training (ASAT)
The automated system for developing training.

Certification
Written verification of proficiency in a given task or tasks.

Class schedule
Documentation of start and end dates for one iteration of a course.

Class size
The number of students in a class.

Commandant's Time
Administrative time included in a program of instruction to provide additional training, correct training deficiencies, or provides time for other requirements.

Conference
A method of instruction that develops the training material through an instructor-guided student discussion.

Counseling
A means of assisting and developing students and subordinates. A leader/instructor counsels subordinates to: praise and reward good performance, develop teamwork, inform soldiers on

how well or how poorly they are performing, assist soldiers to reach required standards, cause soldiers to set personal and professional goals, and help soldiers resolve personal problems.

Course administrative data (CAD)
A resident course document that provides critical planning information used to determine student input requirements for new and revised courses.

Course management plan (CMP)
A document that tells the course manager and instructors how to manage the course.

Course map
A chart that depicts the designed sequence of presentation for a given course, established during course design.

Courseware
An actual instructional package (including content and technique) loaded in a computer, training device, or other instructional delivery system.

Criterion-referenced test
A test that establishes whether or not a unit or soldier performs the learning objective to the established standard.

Decision Point
A decision point describes the moment within a virtual training exercise when the soldier must make a decision. It does not necessarily relate to a specific point in space (such as a certain doorway). It does not necessarily correspond to a specific point in time (such as 10:37 after the squad debarks from the helicopter). It may mean these things, but it is important to consider that decision points occur for many reasons – and that a single decision point within a particular scenario may occur in a different place and time each time the training scenario is executed.

Distributed Interactive Simulation (DIS)
A standard protocol used by independent simulation systems to communicate over a network. The Distributed Interactive Simulation (DIS) protocol was developed in the early 1990's. It is composed of approximately fifteen (15) different types of information called Protocol Data Units (PDUs). The main types are Entity_State_PDU, Collision_PDU, Fire_PDU, and Detonation_PDU. Each simulation broadcasts PDU traffic describing their behavior to other simulations on the network. The other simulations use this information to create a representation of the sending simulated entity within its own simulated world.

Distance learning
The delivery of standardized individual, collective, and self-development training to soldiers and units at the right place and right time through the application of multiple means and technologies.

Enabling learning objective (ELO)
A learning objective that supports the terminal learning objective. It must be learned or accomplished to learn or accomplish the terminal learning objective. It consists of an action, condition, and standard. Enabling objectives are identified when designing the lesson. A terminal learning objective does not have to have enabling objectives, but it may have more than one.

Entity
Objects placed within the simulated environment (For example: mine fields, OPFOR, and mission targets).

Entity State PDU
The most common Protocol Data Unit (PDU) representing all of the state information about a simulated entity that another simulator needs to know. This may include data about an entity's position and velocity.

Evaluation
Measurement of the demonstrated ability of soldiers or units to perform a task, and supporting skill and knowledge; or learning objective against the established standard.

Exercise
Collective task training designed to develop proficiency and crew teamwork in performing the task to the established standard. It also provides practice for performing supporting individual critical tasks. Exercises may be conducted in units and resident training.

(1) Field Training Exercise (FTX)-A scenario-driven tactical exercise used to train and evaluate critical collective and supporting individual tasks in a collective environment which simulates the stress, sounds, and wartime conditions. It is conducted in an austere field environment through all weather conditions and during night as well as day. The FTX should guide soldiers through a series of events exposing them to the rigors of duty performance during wartime operations. It combines combat arms, combat support, and combat service support. An exercise designed to allow a unit/team to engage targets with its organic weapons and support.

(2) Situational Training Exercise (STX)-A short scenario driven mission-oriented tactical exercise that provides a vehicle to train a group of closely related collective tasks and drills together. Situational training exercises provide preconstructed, bite-sized, short-term exercises that are central to sustainment training for tactical mission proficiency.

Federates
Simulations communicating via a data distribution mechanism called the Runtime Infrastructure (RTI).

High Level Architecture
The High Level Architecture protocol is a refinement of the DIS protocol. It was determined that the DIS protocol was not capable of handling larger (theater-sized) simulations that were

being requested by the military. HLA is a new approach for allowing thousands of simulated entities to play in the same simulation without overwhelming the communications infrastructure.

Instructor training
The training of selected personnel in the techniques of teaching to qualify them as instructors.

Land Warrior Test Bed
The Land Warrior Test Bed is a virtual environment testing facility located at Ft. Benning, GA. The test bed houses thirteen (13) Soldier Visualization Stations (SVSs) and a large network of controlling computers and large monitors for group viewing or reviewing.

Lesson
A lesson normally includes telling or showing the soldiers what to do and how to do it, an opportunity for the soldiers to practice, and providing the soldiers feedback concerning their performance. A lesson may take the form of an instructor presented lesson, a SGI-presented lesson, or a self-paced lesson, such as a correspondence course or CBI lesson.

(1) An instructor presented lesson or SGI presented lesson is documented as a lesson plan.
(2) A self-paced lesson must be of sufficient detail that the student can learn the material to the established learning objective standard on his own.
(3) An extension training lesson is a self paced instructional program developed, reproduced, and packaged for distribution to soldiers in the field. These lessons consist of a terminal learning objective, instructional text, practice, and immediate feedback to the soldier.

Lesson outline
An organized outline of the training material to be presented. It identifies the terminal learning objective, enabling learning objectives (optional), learning steps/activities, methods of instruction, media, references, instructor-to-student ratios, resources required, facilities required, safety factors, environmental considerations, and risk factor. The lesson outline is completed during the design phase of the training development process from training analysis data.

Lesson plan
The detailed blueprint for presenting training by an instructor or small group leader (SGL). It prevents training from becoming haphazard and provides for training standardization. It is built on the lesson outline and includes all the details required for the presentation. It must be of sufficient detail that a new instructor can teach the lesson with no decrement of training.

Mandatory release date
Refers to the date at which individual National Guard or United States Army Reserve soldiers must be released from training to return to their home station.

Maximum class size
The largest number of students in a class that can be trained with acceptable degradation in the training effectiveness due to manpower, facility, or equipment constraints.

Media
A means of conveying or delivering information. Examples of training media are paper, film, videotape, broadcast television, and computer program.

Methods of instruction
Indicates exactly how the training material will actually be provided to the student and has an assigned instructor-to-student ratio. Examples of methods of instruction are conference, demonstration, and practical exercise.

Object Model Template
Template describing the format of data in the Runtime Infrastructure allowing different types of systems to interact.

Optimum class size (OCS)
The largest number of students in a class that can be trained with no degradation in training effectiveness. The constraining factor is the availability of equipment, facilities, and manpower. OCS serves as the basis for determining equipment and resource requirements.

Performance measures
The actions that can be objectively observed and measured to determine if a task performer has performed the task to the prescribed standard. These measures are derived from the task performance steps during task analysis.

Performance step
A single discrete operation, movement, or action that comprises part of a task.

Performance test
A test of actual performance of an established criteria, such as a lesson learning objective, to determine if a student can perform the action under the prescribed conditions, to the established absolute standards.

Practical exercise (PE)
The practical exercise is the hands-on application of the performance required in enabling or terminal learning objectives. Gives the student the opportunity to acquire and practice skills, knowledge, and behaviors necessary to perform the training objective successfully.

Prerequisite training
That training which personnel must have successfully completed in order to be qualified for entry into training for which they are now being considered.

Programmed training
The training of a critical task (forwarded to non-proponent schools as a training support package

(TSP) by including the TSP in a formal course of instruction as a stand-alone lesson with a separate lesson number (program of instruction (POI) file number) and specific learning objectives. It is conducted in a structured manner; trained to standard; essential as it serves as the foundation for other training in the course; a qualification training requirement; and evaluated during instruction. It may require use of specific equipment.

Program of instruction (POI)
The POI covers a course/phase. The program of instruction is a requirements document that provides a general description of course content, duration of instruction, types of instruction, and lists resources required to conduct peacetime and mobilization training in an institutional setting. See TRADOC Reg 350-70.

Risk
Risk is characterized by the probability and severity of a potential loss that may result from hazards due to the presence of an enemy, an adversary, or some other hazardous condition. See FM 100-14.

Risk assessment
The identification and assessment of hazards. See FM 100-14

Safety-in-training
The integration of safety requirements and risk management into the training development process. It involves hazard (risk exposure) identification and prevention (risk control techniques) into individual training products, e.g., lesson plans, STPs, and TSPs.

Self-study
Individual study-a soldier learns or reinforces previous learning, on his/her own.

Sequential training
The ordering of training so that the learning of new or more complex skills/knowledge is built upon and reinforces previously learned material.

Simulation Networking (SIMNET)
Simulations performed via a computer network provide the potential for cost-effective training by reducing the resources required to support training and the time required to set up an exercise.

Skill
The ability to perform a job related activity that contributes to the effective performance of a task performance step.

Small group instruction (SGI)
A means of delivering training which places the responsibility for learning on the soldier through participation in small groups led by small group leaders who serve as role models throughout the course. SGI uses small group processes, methods, and techniques to stimulate learning.

Small group leader (SGL)
An instructor who facilitates role modeling, counseling, coaching, learning, and team building in SGI.

Soldier Manual of Common Tasks (SMCT)
A document that contains the critical tasks, which every soldier must be able to perform in order to fight and win on the battlefield. It provides the conditions, standards, and performance measures for each common soldier critical task.

Soldier Visualization Station
A curtained room 10' x 10' x 10' with one wall being a rear-projection display screen. Projected onto the screen is an image of a virtual world. A single soldier is "instrumented" by wearing a helmet with radio frequency sensors on it. He/she is equipped with a radio and simulation rifle that is networked to the control center computer. Detectors in the room determine the soldier's location and posture.

Standard
A statement that establishes criteria for how well a task or learning objective must be performed. The standard specifies how well, completely, or accurately a process must be performed or product produced. (1) The task standard reflects task performance requirements on the job. (2) The learning objective standard reflects the standard that must be achieved in the formal learning environment.

Student evaluation plan
A plan that details how the proponent school will determine if the student has demonstrated a sufficient level of competency to pass the specified course or training. It specifically identifies course completion requirements to include the minimum passing score (or go/no go) for each written or performance examination, final grade requirement, minimum course attendance requirements (if applicable), and specific tests that must be satisfactorily completed to graduate.

It very specifically identifies how the student's performance will be evaluated. Specific lessons tested in each test are identified. Counseling and retesting policy are delineated. Other evaluations, such as the Army Weight Control Program and Army Physical Fitness Test, that impact on graduation are identified, and their requirements included.

Student performance counseling
Communication, as related to training, which informs soldiers/students about their training and the expected performance standards and provides feedback on actual performance. Soldier/student performance includes appearance, conduct, learning accomplishment, and the way learning is being carried out. See FM 22-100, App C.

Systems Approach to Training (SAT)
Is a disciplined, logical approach to making collective, individual, and self-development training decisions for the Army. It determines whether or not training is needed; what is trained; who gets the training; how, how well, and where the training is presented; and

the training support/resources required to produce, distribute, implement, and evaluate those products. The SAT involves all five training related phases: analysis, design, development, implementation, and evaluation.

TASS Integration Element (TIE)
The TRADOC office in the CONUS sub geographical region that coordinates Army training instructors, students, training devices, equipment, and facilities for Reserve Component individual soldier training.

TASS Training Battalion
A functionally aligned organization that executes ADT classes and coordinates IDT/ADT classes in other states and is accredited by the proponent.

TASS Training Institution
The education/training environment of the Army (Active Army, Reserve Component, and Civilians) which encompasses all Army sites where a soldier and civilian can receive training, to included proponent schoolhouses, TASS training battalions, TASS training sites, Army Training Centers, RTI/RTS, DL classroom, and Classroom XXI.

Technique of delivery
Process or manner of delivering instruction that includes one or more methods. For example, group-paced instruction could use conference, discussion, demonstration, and practical exercise. A technique of delivery may involve a whole course, a phase, or a module.

Test
A device, technique, or measuring tool used to determine if a student or group can accomplish the objective to the established standard. Determine if training does what it is designed to do efficiently and effectively. Measures the skill, knowledge, intelligence, abilities, or other aptitudes of an individual or group. Collect data as a basis for assessing the degree that a system meets, exceeds, or fails to meet the technical or operational properties ascribed to the system.

1. **Criterion-referenced test**
   A test that establishes whether or not a unit or soldier performs the learning objective to the established standard. Performance is measured as a "go" or "no-go" against a prescribed criterion or set of criteria - the learning objective standard. It is scored based upon absolute standards, such as job competency, rather than upon relative standards, such as class standings.
2. **Norm-referenced test**
   A test that grades a student based on performance of other students taking the same test. Is scored based upon relative standards, such as class standings, rather than upon absolute standards, such as job competency.

The Army School System (TASS)
A composite school system comprised of the AC, ARNG, and USAR institutional training

systems. TASS, through the Army's training proponents, provides standard training courses to America's Army, focusing on three main points of effort---standards, efficiencies, and resources. TASS training battalions are arranged in regions and functionally aligned with the training/TD (task) proponents.

TASS school battalions
The training institution of both the ARNG (state military academies, National Guard Bureau (NGB) Regional NCOA/schools, etc.) and USAR (U.S. Army Reserve Forces schools/USARC NCOA, etc.). TASS school battalions comprise all NCOAs and schools of the Reserve Component.

The Army Training System (TATS) course
A course designed to train the same MOS/AOC skill level or ASI, LIC, SQI, SI within the Army. The course ensures standardization by training all course critical tasks to task performance standard. It may be trained at different sites and may involve use of different media/methods to train the various phases/modules/lessons.

The Army Training System (TATS) POI
A requirements document that provides a general description of The Army Training System Course content, duration of instruction, and methods of instruction and media. It lists critical tasks taught and resources required to conduct peacetime and mobilization training. Note: This is the objective TATS POI; currently being automated.

Training management
The process commanders and their staff use to plan training and related resource requirements needed to conduct and evaluate training. It involves all echelons and applies to any unit in the Army regardless of strength, mission, organization, or equipment assigned.

Training materials
Those materials developed as a result of training design and provided to teach or evaluate training. They include, but are not limited to; computer based instruction, correspondence courses, training literature products, student handouts, simulation scenarios, and other products used to train to a prescribed standard.

Training method
The procedure or process for attaining a training objective. Examples include lecture, demonstration, discussion, assigned reading, exercise, examination, seminar, simulation, and programmed instruction.

Training objective
A statement that describes the desired outcome of a training activity in the unit. It consists of the following three parts: task, condition(s), and standard.

Training plan
A detailed description of the actions, milestones, and resources required to implement a training strategy. The detail depends upon the plan type and level.

Training safely
Achieved by identifying task performance safety hazards and integrating safety in training procedures during training design, development and implementation. Safety in training and training safely are not one and the same.

Training support
The provision of the materials, personnel, equipment, or facilities when and where needed to implement the training. It includes such functions as the reproduction and distribution of training products and materials, training scheduling, student record maintenance.

Training Support Center (TSC)
An authorized installation activity with area responsibility to provide storage, instruction, loan/issue, accountability, and maintenance for TADSS.

Training Support Package (TSP)
A complete, exportable package integrating training products, materials, and/or information necessary to train one or more critical tasks. Its contents will vary depending on the training site and user. A TSP for individual training is a complete, exportable package integrating training products/materials necessary to train one or more critical individual tasks. A TSP for collective training is a package that can be used to train critical collective and supporting critical individual tasks (including leader and battle staff.

Validation
An evaluation of the training products and materials. It is the process used to determine if training accomplishes its intended purpose. Validation and revising training are continuous actions in the teaching/revising process of training improvement. Validate products and materials to—

1. Verify their training effectiveness in training the objective.
2. Determine beneficial improvements in the quality of training products and materials.
3. Identify training product deficiencies.
4. Improve efficiency and effectiveness of training objectives, sequence, products, and materials. In the "testing" context, it is the process of determining the degree of validity of a measuring instrument (e.g., skill qualification test, end of module test, and end of course comprehensive test). In the "technical manual" context, it is the process used by a contractor to test an equipment publication for completeness, compliance with contractual requirements, and technical accuracy.

Appendix C

Level 1 Training Mission: Patrol

Training/Learning Objective

The trainee will demonstrate his leadership skills by coordinating movement of his subordinates throughout the simulation.

Mission Description

Soldiers negotiate the urban terrain and report findings.

Mission Setting

Aceh, Indonesia (Population 3,500,000)

Mission Features

- Restrictive Rules of Engagement
- Multi-Cultural Densely Populated Urban Terrain
- Citizenry

Mission Background

Indonesia's government and infrastructure have fallen. The country's attempt to become a democracy has failed and has subsequently led to ethnic, religious and economic conflict. Tens of thousands have died as a result of tribal warfare and ethnic 'cleansing'. Strategic bombings by 'religious extremists' has also taken a toll on the once growing, but now struggling country. Starvation is the second leading cause of death in the region.

Indonesia's neighboring countries have requested and been granted United Nations assistance in bringing the region under control. A U.N. Military force is assembled and dispatched to bring peace to the region.

The United States commits several infantry regiments, under the name 'Task Force Blue', to the U.N.'s 'Operation Safe Order'. Task Force Blue arrives and begins to provide support to the relief effort.

Mission Players

Fire Team/Delta Squad/Task Force Blue (4)

1.	Team Leader	(Trainee)
2.	Rifleman	(Semi-Automated Force)
3.	SAW Gunner	(Semi-Automated Force)
4.	Grenadier	(Semi-Automated Force)

Non-Combatants (5)

1.	Adult	(Automated Entity)
2.	Adult	(Automated Entity)
3.	Adult	(Automated Entity)
4.	Adult	(Automated Entity)
5.	Adult	(Automated Entity)

Mission Conditions

Situation
Task Force Blue is occupying the city of Aceh and conducting humanitarian relief. Troops are periodically dispersed throughout the city to conduct patrol operations.

Enemy
Numerous civilians are in the area. Unknown threat.

Terrain/Location
Open common areas around the 'A' buildings in the city of Aceh. The city is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat).

Commanders Intent
The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region.

'The soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations.' *The Rules-of-Engagement (ROE)* are restrictive; 'the use of force is only justified in the direct defense of oneself or another' and 'no overt damage to the structures or disruption of the local services will be tolerated.' Casualties are not acceptable.

Organization
Fire teams of Alpha Platoon, Task Force Blue, are dispersed throughout the city to conduct periodic patrols.

Communication

A *Situation Report (SITREP)* is expected when the tasked fire team completes a visual check of each building in the assigned patrol area and at the conclusion of the patrol.

Mission

A fire team from Delta Squad is assigned to systematically patrol the northwest portion of the city, Aceh. The team will confine their activities to the areas around the 'A' buildings. The patrol will refrain from entering the buildings. The patrol will conclude after the areas around each of the 'A' buildings have been checked. Upon completion of the patrol, the fire team will return to the Start Point, West of building A1.

Player Actions/Deployment

Fire Team

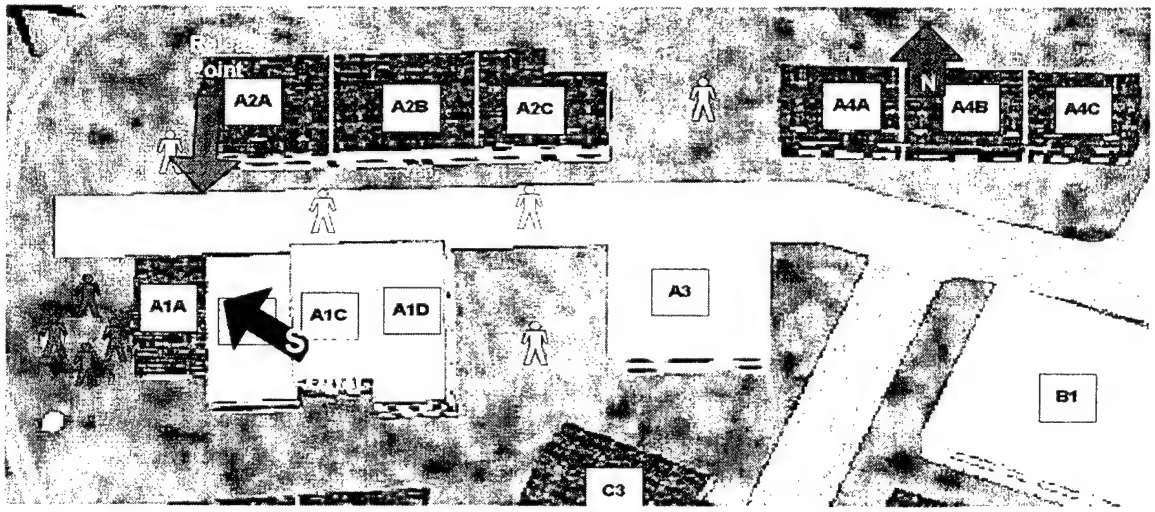
Soldiers

Player	*Action*	*Location*
1. Team Leader (T)	Lead/direct Rifleman	West of Building A1A
2. Rifleman (SAF)	Respond to Team Leader	West of Building A1A
3. SAW Gunner (SAF)	Follow Rifleman	West of Building A1A
4. Grenadier (SAF)	Follow Rifleman	West of Building A1A

Non-Combatants

Civilians

Player	*Action*	*Location*
1. Adult (Entity)	Roving Freely	Between A1 and A2
2. Adult (Entity)	Roving Freely	Between A1 and A2
3. Adult (Entity)	Roving Freely	Between A1 and A3
4. Adult (Entity)	Roving Freely	East of A2
5. Adult (Entity)	Roving Freely	West of A2



Representation of Deployment and Operational Area

Simulation Functionality

The trainee is responsible for coordinating the movement of the soldiers at his disposal. The movement and actions are limited and are dependent upon the BattleMaster. The trainee is required to verbally instruct Semi-Automated Forces (SAF) via the BattleMaster. Additional immersed trainees can replace SAF soldiers and will be instructed directly. The trainee will issue instructions by first identifying the soldier and then describing the movement required, i.e. 'Soldier 2- follow me' or Soldier 2- Go around to the back of this building,' etc. SAF soldiers will not relay intelligence.

Training and Mission Event Stream

Preparation

The trainee is provided a graphical representation of the city (Training Aide 1). The trainee is verbally briefed with the *Mission Background, Setting, Conditions* and *Simulation Functionality.*

Movement

The team leader will provide comprehensive instructions to the Rifleman, via the BattleMaster. The BattleMaster will direct the Rifleman (SAF) as if he were a subordinate of the team leader. The Saw Gunner and the Grenadier will follow the Rifleman and emulate the Rifleman's actions.

The fire team will be deployed to the west of building A1. The fire team will patrol the area assigned, excluding the interiors of the buildings. The fire team will return to the west of building A1 after the patrol mission is accomplished.

Communication

The fire team leader will report to the Delta Squad leader via the radio. The BattleMaster will also act as the Delta Squad leader (operating remotely). The BattleMaster will respond to the communications as necessary, i.e. clarify instructions upon request and accepting SITREP's, etc.

The fire team leader will provide a SITREP after the exterior of each building has been checked and upon returning to the starting point.

Call Signs:

- Delta Squad Leader -'Sierra Lima'
- Fire Team Leader-'Tango Lima'

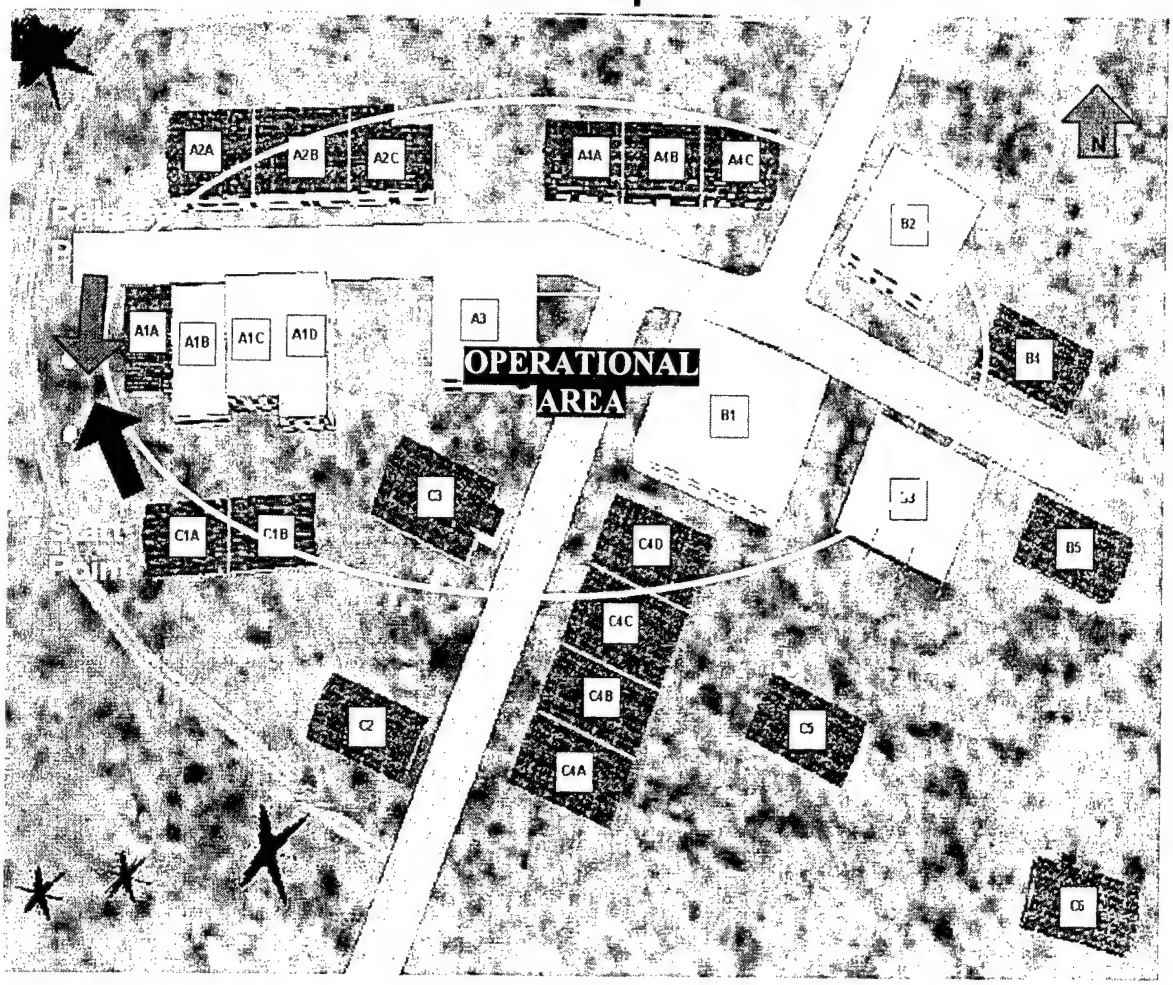
Scripted Communications:

Sierra Lima- "Tango Lima, this is Sierra Lima, where is my SITREP?"
(Stated if the trainee fails to provide SITREP per mission requirements)

Termination of Training Mission

The trainer will provide the training participants a complete and thorough *After Action Review (AAR)* of their efforts during the mission. The AAR will include the presentation of the participants captured Decision Factors, via ViSSA. The AAR will be structured from the standpoint of the participants' efforts as associated with the adherence to the mission's Training/Learning Objective.

Training Aid 1
Mission Map of Terrain



Appendix D

Level 2 Training Mission: Injured Soldier

Training/Learning Objective

The trainee will demonstrate his judgment and leadership skills by coordinating the movement of his subordinates throughout the simulation.

Mission Description

Soldiers negotiate the urban terrain to locate an injured soldier.

Mission Setting

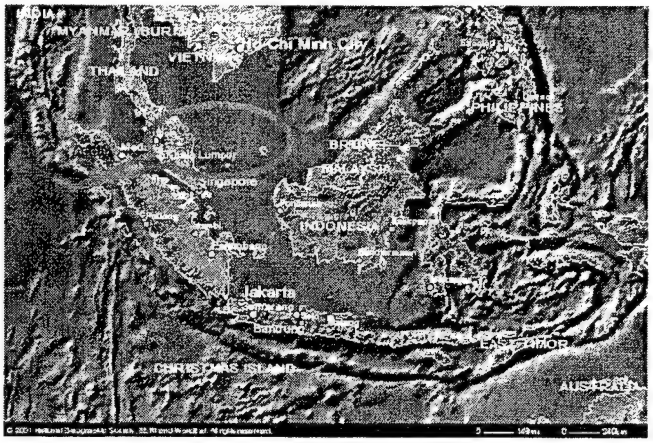
Aceh, Indonesia (Population 3,500,000)

Mission Features

- Densely Populated Urban Terrain
- Restrictive Rules of Engagement
- Resistant Multi-Cultural Citizenry

Mission Background

Indonesia's government and infrastructure have fallen. The country's attempt to become a democracy has failed and has subsequently led to ethnic, religious and economic conflict. Tens of thousands have died as a result of tribal warfare and ethnic 'cleansing'. Strategic bombings by 'religious extremists' has also taken a toll on the once growing, but now struggling country.



Geographical Location of Aceh, Indonesia

Starvation is the second leading cause of death in the region. Indonesia's neighboring countries have requested and been granted United Nations assistance in bringing the region under control. A U.N. Military force is assembled and dispatched to bring peace to the region.

The United States commits several infantry regiments, under the name 'Task Force Blue', to the U.N.'s 'Operation Safe Order'. Task Force Blue arrives and begins to provide support to the relief effort.

Mission Players

Delta Squad/Task Force Blue (10)

5.	Squad Leader	(Trainee)
6.	Team Leader	(Semi-Automated Force)
7.	Rifleman	(Semi-Automated Force)
8.	Grenadier	(Semi-Automated Force)
9.	SAW Gunner	(Semi-Automated Force)
10.	Team Leader	(Semi-Automated Force)
11.	Rifleman	(Semi-Automated Force)
12.	Grenadier	(Semi-Automated Force)
13.	SAW Gunner	(Semi-Automated Force)
14.	Injured Soldier	(Semi-Automated Force)

Non-Combatants (11)

6.	Adult	(Automated Entity)
7.	Adult	(Automated Entity)
8.	Adult	(Automated Entity)
9.	Adult	(Automated Entity)
10.	Adult	(Automated Entity)
11.	Adult	(Automated Entity)
12.	Adult	(Automated Entity)
13.	Adult	(Automated Entity)
14.	Adult	(Automated Entity)
15.	Adult	(Automated Entity)
16.	Adult	(Automated Entity)

Mission Conditions

Situation

An injured soldier from Delta Squad is inadvertently separated from the unit after a brief skirmish with civilian demonstrators.

Enemy

Numerous unarmed civilian demonstrators are in the area.

Terrain/Location

Structures located in the city. Aceh is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat).

Commanders Intent

The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region. 'Soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations.' *The Rules-of-Engagement (ROE)* are restrictive; 'the use of force is only justified in the direct defense of oneself or another' and 'no overt damage to the structures or disruption of the local services will be tolerated.' Casualties are not acceptable.

Organization

Squads from Alpha Platoon, Task Force Blue, are involved in a search effort.

Communication

A clear radio net has been established. A *Situation Report (SITREP)* is expected after each building is searched, upon locating the injured soldier and at any other notable event.

Mission

Delta Squad is assigned to search the buildings surrounding the area occupied by the protesters. Delta Squad will search buildings C2 and C3 and attempt to locate the missing/injured soldier. Upon locating the soldier, the squad will return him to the Tactical Operations Center (TOC), building C5.

Player Actions/Deployment

Soldiers

Team 1

Player	*Action*	*Location*
1. Squad Leader (T)	Lead and direct Team Leaders	South of Building C4
2. Fire Team Leader (SAF)	Respond to Squad Leader	South of Building C4
3. Rifleman (SAF)	Follow Team Leader	South of Building C4
4. Grenadier (SAF)	Follow Team Leader	South of Building C4
5. SAW Gunner (SAF)	Follow Team Leader	South of Building C4

Team 2

Player	*Action*	*Location*
1. Fire Team Leader (SAF)	Respond to Squad Leader	South of Building C4
2. Rifleman (SAF)	Follow Team Leader	South of Building C4
3. Grenadier (SAF)	Follow Team Leader	South of Building C4
4. SAW Gunner (SAF)	Follow Team Leader	South of Building C4

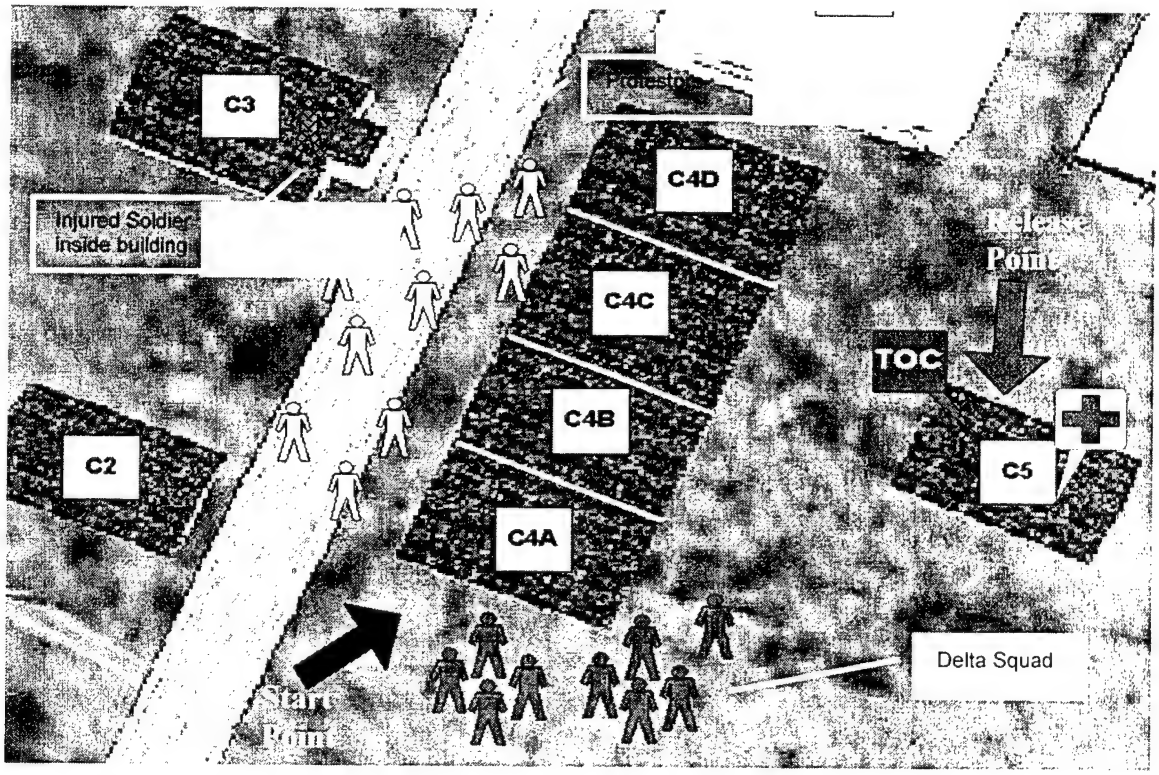
Non-Combatants

Individual Soldier

Player	*Action*	*Location* (ref to Buildings)
1. Injured Soldier (SAF)	Animated upon contact	Inside C3

Demonstrators

Player	*Action*	*Location* (ref to Buildings)
1. Adult (Entity)	Roving Freely	Between C4, C3 and C2
2. Adult (Entity)	Roving Freely	Between C4, C3 and C2
3. Adult (Entity)	Roving Freely	Between C4, C3 and C2
4. Adult (Entity)	Roving Freely	Between C4, C3 and C2
5. Adult (Entity)	Roving Freely	Between C4, C3 and C2
6. Adult (Entity)	Roving Freely	Between C4, C3 and C2
7. Adult (Entity)	Roving Freely	Between C4, C3 and C2
8. Adult (Entity)	Roving Freely	Between C4, C3 and C2
9. Adult (Entity)	Roving Freely	Between C4, C3 and C2
10.Adult (Entity)	Roving Freely	Between C4, C3 and C2
11.Adult (Entity)	Roving Freely	Between C4, C3 and C2



Representation of Deployment

Simulation Functionality

The trainee is responsible for coordinating the movement of the soldiers at his disposal. The movement and actions of Semi-Automated Forces (SAF) are limited and are dependent upon the BattleMaster. The trainee is required to verbally instruct SAF via the BattleMaster. Additional immersed trainees can replace SAF soldiers and will be instructed directly. If used, additional trainees should assume the roles of the fire team leaders in this scenario. The trainee will issue instructions by first identifying the soldier or unit and then describing the movement required, i.e. 'Soldier 2- follow me' or Fire Team 2- Go around to the back of this building,' etc. SAF soldiers will not relay intelligence.

Training and Mission Event Stream

Preparation

The trainee is provided a graphical representation of the city (Training Aide 1). The trainee is verbally briefed with the *Mission Background, Setting, Conditions* and *Simulation Functionality.*

Movement

The squad leader will provide comprehensive instruction to the fire team leaders, via the BattleMaster. The BattleMaster will direct the fire team leaders and the members of the fire team (SAF) as if they were subordinate to the squad leader.

The soldiers are deployed south of building C4. The squad leader will direct the fire teams in searching the assigned buildings for the injured soldier. The injured soldier will become animated and respond to the directions of the squad leader when found.

The soldiers will return to the Tactical Operations Center (TOC), building C5, upon locating and securing the injured soldier.

Communication

The BattleMaster will act as the team leaders and Alpha Platoon leader (operating remotely). The BattleMaster will accept and respond to radio communications for each of them accordingly. The BattleMaster will respond to the communications as necessary, i.e. clarify instructions upon request or accept SITREP's, etc.

The Delta Squad leader will provide a SITREP after each assigned building has been searched and at the point when the injured soldier is located.

- Alpha Platoon Leader- 'Papa Lima'
- Delta Squad Leader- 'Alpha 4'

- Fire Team Leader 1- 'Tango 1'
- Fire Team Leader 2- 'Tango 2'

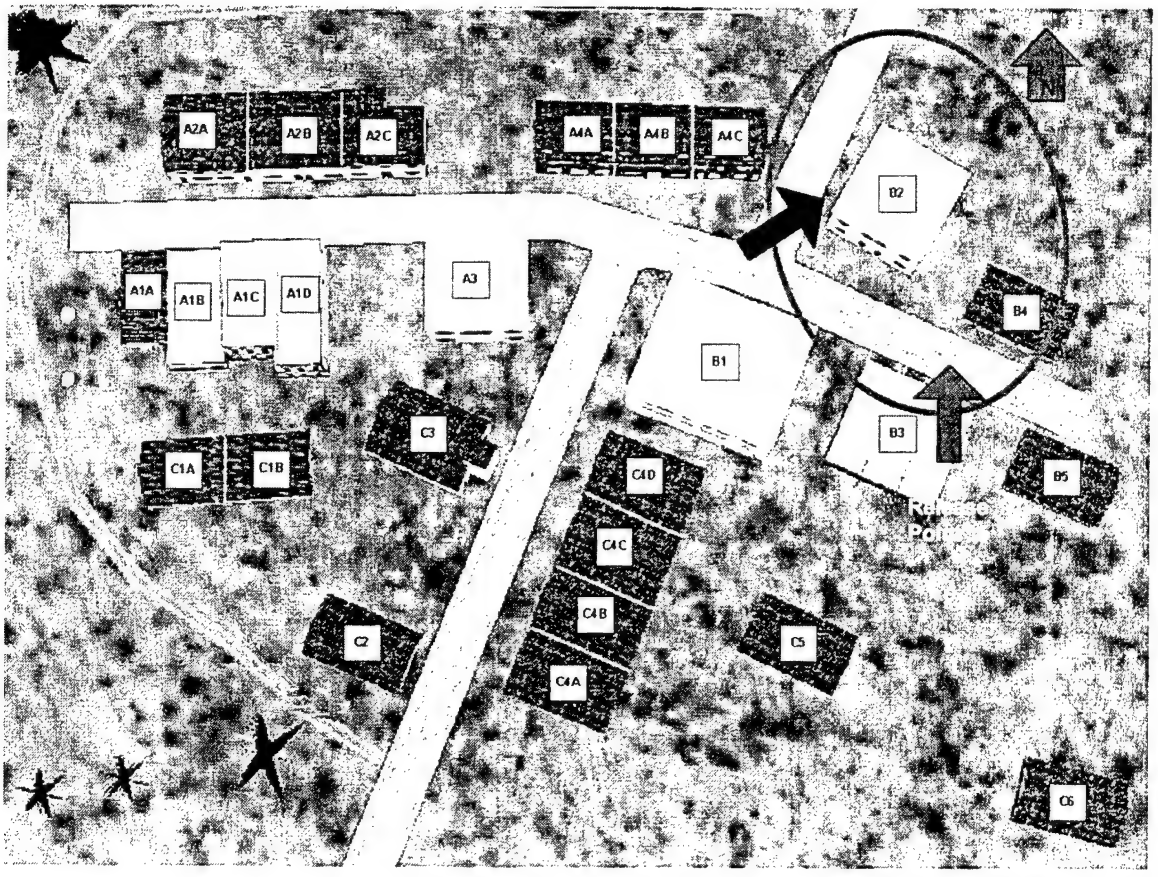
Scripted Communications:

Papa Lima- "Alpha 4, this is Papa Lima, SITREP."
(Stated if the trainee fails to provide SITREP per mission requirements)

Termination of Training Mission

The trainer will provide the training participants a complete and thorough *After Action Review (AAR)* of their efforts during the mission. The AAR will include the presentation of the participants captured Decision Factors, via ViSSA. The AAR will be structured from the standpoint of the participants' efforts as associated with the adherence to the mission's Training/Learning Objective.

Training Aid 1
Mission Map of Terrain



Appendix E

Level 2 Training Mission: Building Search

Training/Learning Objective

The trainee will demonstrate his judgment and leadership skills by coordinating movement and response of his soldiers throughout the simulation.

Mission Description

Soldiers conduct search of assigned buildings.

Mission Setting

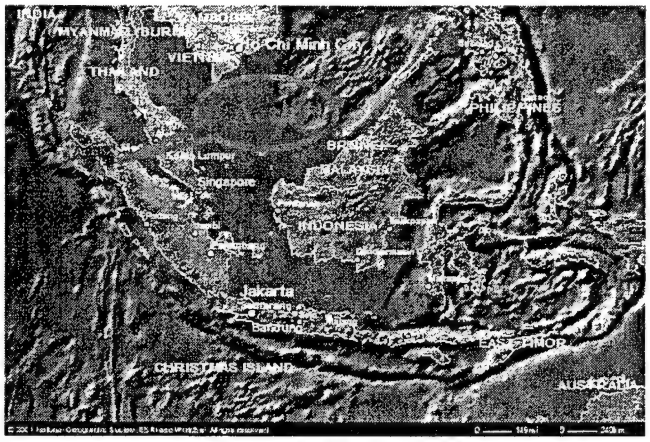
Aceh, Indonesia (Population 3,500,000)

Mission Features

- Urban Terrain
- Restrictive Rules of Engagement
- Resistant Multi-Cultural Citizenry
- Chemical Weapons

Mission Background

Indonesia's government and infrastructure have fallen. The country's attempt to become a democracy has failed and has subsequently led to ethnic, religious and economic conflict. Tens of thousands have died as a result of tribal warfare and ethnic 'cleansing'. Strategic bombings by 'religious extremists' has also taken a toll on the once growing, but now struggling country.



Geographical Location of Aceh, Indonesia

Starvation is the second leading cause of death in the region.

Indonesia's neighboring countries have requested and been granted United Nations assistance in bringing the region under control. A U.N. Military force is assembled and dispatched to bring peace to the region.

The United States commits several infantry regiments, under the name 'Task Force Blue', to the U.N.'s 'Operation Safe Order'. Task Force Blue arrives and begins to provide support to the relief effort.

Mission Players

Delta Squad/Task Force Blue (9)

15.	Squad Leader	(Trainee)
16.	Team Leader	(Semi-Automated Force)
17.	Rifleman	(Semi-Automated Force)
18.	Grenadier	(Semi-Automated Force)
19.	SAW Gunner	(Semi-Automated Force)
20.	Team Leader	(Semi-Automated Force)
21.	Rifleman	(Semi-Automated Force)
22.	Grenadier	(Semi-Automated Force)
23.	SAW Gunner	(Semi-Automated Force)
24.	Injured Soldier	(Semi-Automated Force)

Non-Combatants (3)

17.	Adult	(Automated Entity)
18.	Adult	(Automated Entity)
19.	Adult	(Automated Entity)

Mission Conditions

Situation

A terrorist stronghold has been identified and dominated by Task Force Blue. No resistance has been noted and no terrorists have been observed. The compound appears to be abandoned.

Enemy

This faction is known to use small arms and has been suspected of obtaining 'chemical munitions'.

Terrain/Location

Several industrial buildings near the center of Aceh. The compound includes buildings B2 and B4. Aceh is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat).

Commanders Intent
The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region.

"Soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations." *The Rules-of-Engagement (ROE)* are restrictive; "the use of force is justified only in the direct defense of oneself or another" and "no overt damage to the structures or disruption of the local services will be tolerated." Casualties are not acceptable.

Organization
Delta Squad, Alpha Platoon of Task Force Blue.

Communication
A clear radio net has been established for use during the mission. A *Situation Report (SITREP)* is expected after each assigned building has been searched, terrorists are located or at any other notable event.

Mission
Delta Squad will search buildings B2 and B4 for terrorists. Delta Squad will be deployed to the west of building B2. Fire Team 1 will make entry into each of the buildings while Fire Team 2 maintains exterior security. After the assigned buildings have been searched, Delta Squad will assemble in the road at a point southeast of building B4.

Player Actions/Deployment

Soldiers

Team 1

Player	***Action***	***Location*** (ref to Buildings)
1. Squad Leader (T)	Lead and direct Team Leaders	South of B2
2. Fire Team Leader (SAF)	Respond to Squad Leader	South of B2
3. Rifleman (SAF)	Follow Team Leader	South of B2
4. Grenadier (SAF)	Follow Team Leader	South of B2
5. SAW Gunner (SAF)	Follow Team Leader	South of B2

Team 2

Player	***Action***	***Location*** (ref to Buildings)
1. Fire Team Leader (SAF)	Respond to Squad Leader	South of B2
2. Rifleman (SAF)	Follow Team Leader	South of B2
3. Grenadier (SAF)	Follow Team Leader	South of B2
4. SAW Gunner (SAF)	Follow Team Leader	South of B2

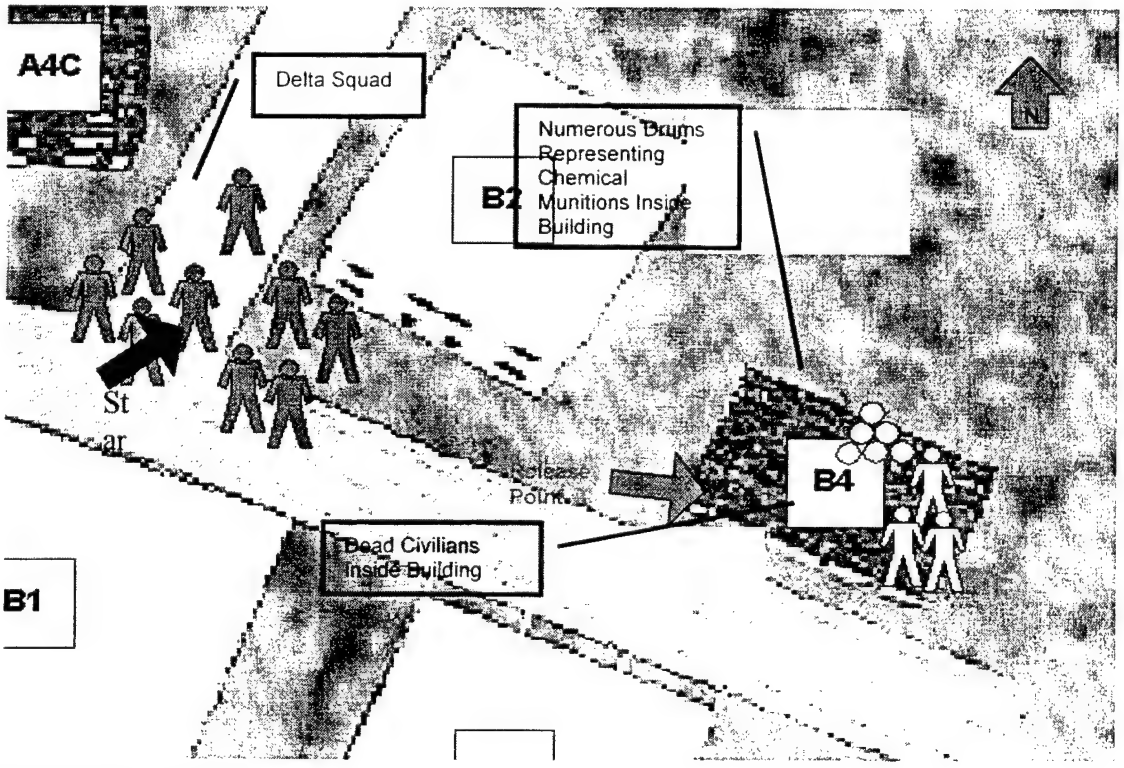
Non-Combatants

Civilians

Player	*Action*	*Location* (ref. To Buildings)
1. Adult (Entity)	Laying Dead	Inside B4 near 2 and 3
2. Adult (Entity)	Laying Dead	Inside B4 near 1 and 3
3. Adult (Entity)	Laying Dead	Inside B4 near 1 and 2

Inanimate-Entities

Entity	*Location* (ref. To Buildings)
1. Numerous Steel Drums	Inside Near Civilians



Representation of Deployment

Simulation Functionality

The trainee is responsible for coordinating the movement of the soldiers under his command. The movement and actions are limited and are dependent upon the BattleMaster. The trainee is required to verbally instruct Semi-Automated Forces (SAF) via the BattleMaster. Additional immersed trainees can replace SAF soldiers and will be instructed directly. The trainee will issue instructions by

first identifying the soldier or unit by their appropriate call sign and then describe the movement required, i.e. 'Soldier 2- follow me' or 'Fire Team 2- surround the building' etc. SAF soldiers will not relay intelligence.

Mission Event Stream

Preparation

The trainee is provided a graphical representation of the city (Training Aide 1). The trainee is verbally briefed with the *Mission Background, Setting, Conditions* and *Simulation Functionality.*

Movement

The squad leader will provide comprehensive instruction to the fire team leaders, via the BattleMaster. The BattleMaster will direct the fire team leaders and corresponding fire teams (SAF) as if they were subordinate to the squad leader. The fire team members will mirror the movements of the fire team leader unless the squad leader otherwise stipulates their movement Individually.

Delta Squad will be deployed from a position west of building B2. The soldiers of Delta Squad will search the assigned buildings, B2 and B4. Upon locating the Chemical munitions and civilians lying dead in building B4, the squad leader should halt operations, evacuate the building, and report his findings to the platoon leader, via the BattleMaster. The room containing the chemical munitions will be lethal to the soldiers of the fire team, unless they evacuate within a predetermined period of time established by the BattleMaster.

The scenario will conclude when the fire team evacuates the building or the soldiers are immobilized, whichever occurs first.

Communication

The BattleMaster will act as the team leaders and Alpha Platoon leader (operating remotely). The BattleMaster will accept and respond to radio communications for each of them accordingly. The BattleMaster will respond to the communications as necessary, i.e. clarify instructions upon request or accept SITREP's, etc.

The Delta Squad leader will provide a SITREP after each assigned building has been searched.

Call Signs:

- Alpha Platoon Leader -'Papa Lima'

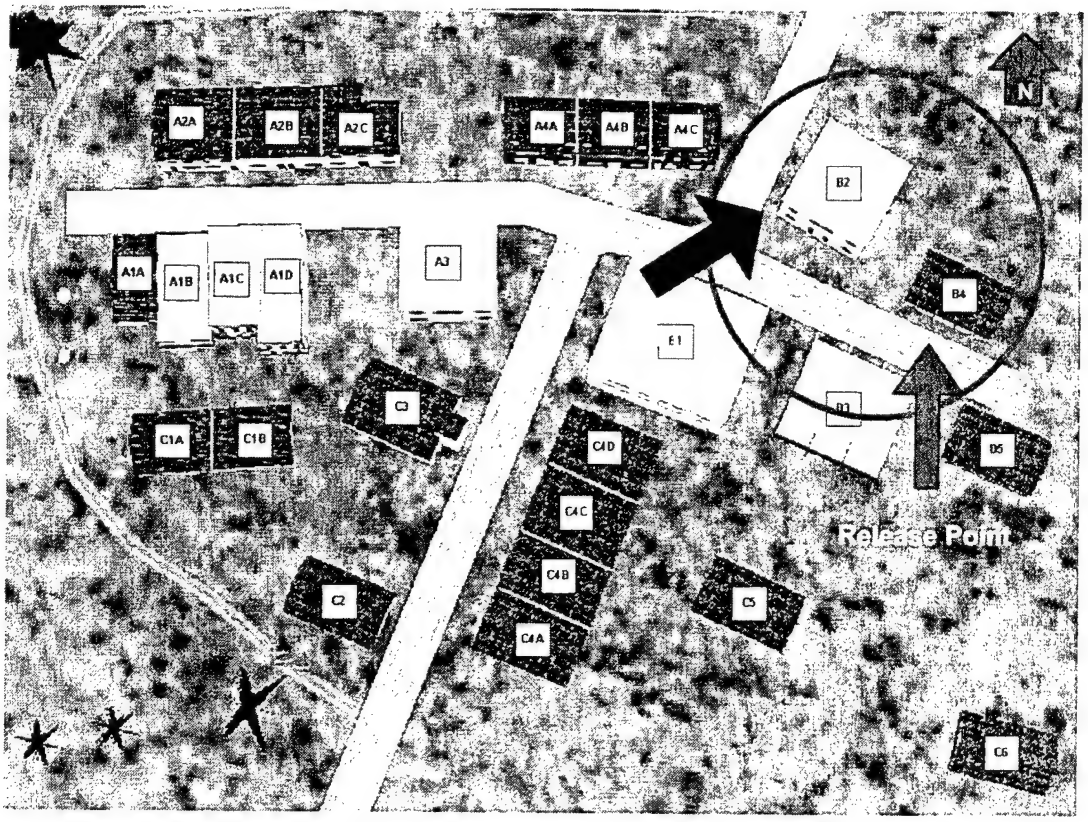
- Delta Squad Leader -'Alpha 4'
- Fire Team Leader 1 -'Tango 1'
- Fire Team Leader 2 -'Tango 2'

Scripted Communications:

- Papa Lima- "Alpha 4, this is Papa Lima, SITREP."
  (Stated if the trainee fails to provide SITREP per mission requirements)

- Papa Lima- "Alpha 4, this is Papa Lima, be advised that some of the locals have recently detected a strange odor coming from this building. Use Caution. Out."*(Right before Fire Team 1 enters building B4)*

Training Aid 1
Mission Map of Terrain



Appendix F

Level 3 Training Mission: Engage Sniper

Training/Learning Objective

The trainee will demonstrate his judgment and leadership skills by coordinating movement and response of a subordinate to events occurring throughout the simulation.

Mission Description

Soldiers immediately respond to and eliminate a sniper who is targeting civilians.

Mission Setting

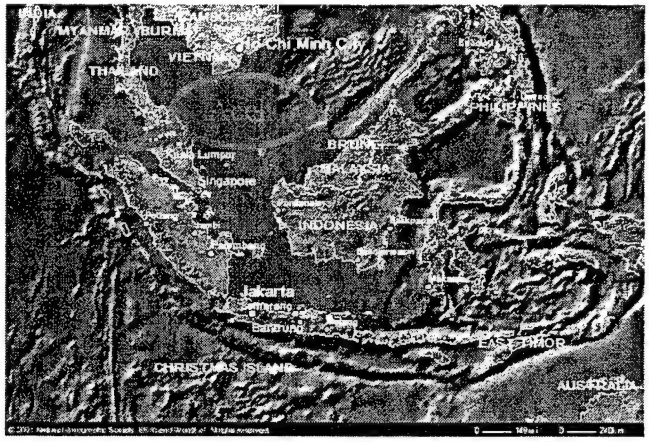
Aceh, Indonesia (Population 3,500,000)

Mission Features

- Urban Terrain
- Humanitarian Relief effort.
- Restrictive Rules of Engagement
- Neutral and Resistant Multi-Cultural Citizenry
- Occupation by Multi-National UN Forces

Mission Background

Indonesia's government and infrastructure have fallen. The country's attempt to become a democracy has failed and has subsequently led to ethnic, religious and economic conflict. Tens of thousands have died as a result of tribal warfare and ethnic 'cleansing'. Strategic bombings by 'religious extremists' has also taken a toll on the once growing, but now struggling country. Starvation is the second leading cause of death in the region.



Geographical Location of Aceh, Indonesia

Indonesia's neighboring countries have requested and been granted United Nations assistance in bringing the region under control. A U.N. military force is assembled and dispatched to bring peace to the region.

The United States commits several infantry regiments, under the name 'Task Force Blue', to the U.N.'s 'Operation Safe Order'. Task Force Blue arrives and begins to provide support to the relief effort.

Mission Players

Soldiers of Alpha Platoon/Task Force Blue (2)

25. Platoon Leader	(Trainee)
26. Driver	(Semi-Automated Force)

Opposing Force (1)

1. Sniper	(Semi-Automated Forces)

Non-Combatants (9)

20. Adult	(Automated Entity)
21. Adult	(Automated Entity)
22. Adult	(Automated Entity)
23. Adult	(Automated Entity)
24. Adult	(Automated Entity)
25. Adult	(Automated Entity)
26. Adult	(Automated Entity)
27. Adult	(Automated Entity)
28. Adult	(Automated Entity)

Mission Conditions

Situation

A sniper is shooting at civilian protestors. The platoon leader and his driver stumble into the sniper assault while enroot to headquarters (HQ), building C2. The platoon leader and driver see the protesters and hear gunfire. The platoon leader and driver have exited their vehicle to investigate.

Enemy

Single terrorist sniper equipped with rifle.

Terrain/Location

The platoon Leader and driver are located in the roadway to the north of building B3. The protestors are located in the open area around building A3. The city of Aceh is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat).

Commanders Intent

The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region.

'Soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations.' *The Rules-of-Engagement (ROE)* are restrictive; 'the use of force is only

justified in the direct defense of oneself or another' and 'no overt damage to the structures or disruption of the local services will be tolerated.' Casualties are not acceptable.

Organization
The platoon leader and driver of Alpha Platoon are temporarily detached from their unit.

Communication
A *Situation Report (SITREP)* is expected at all notable events throughout the mission.

Mission
The platoon leader is to take the appropriate action to safeguard the population from harm. The platoon leader will eliminate the threat and continue on to HQ, building C2.

Player Actions/Deployment

Soldiers

Platoon Leader and Driver

Player	***Action***	***Location*** (ref. To Buildings)
1. Platoon Leader (trainee)	Lead and direct Driver	Road North of B3
2. Driver (SAF or trainee)	Respond to Platoon Leader	Road North of B3

Opposing Force(s)

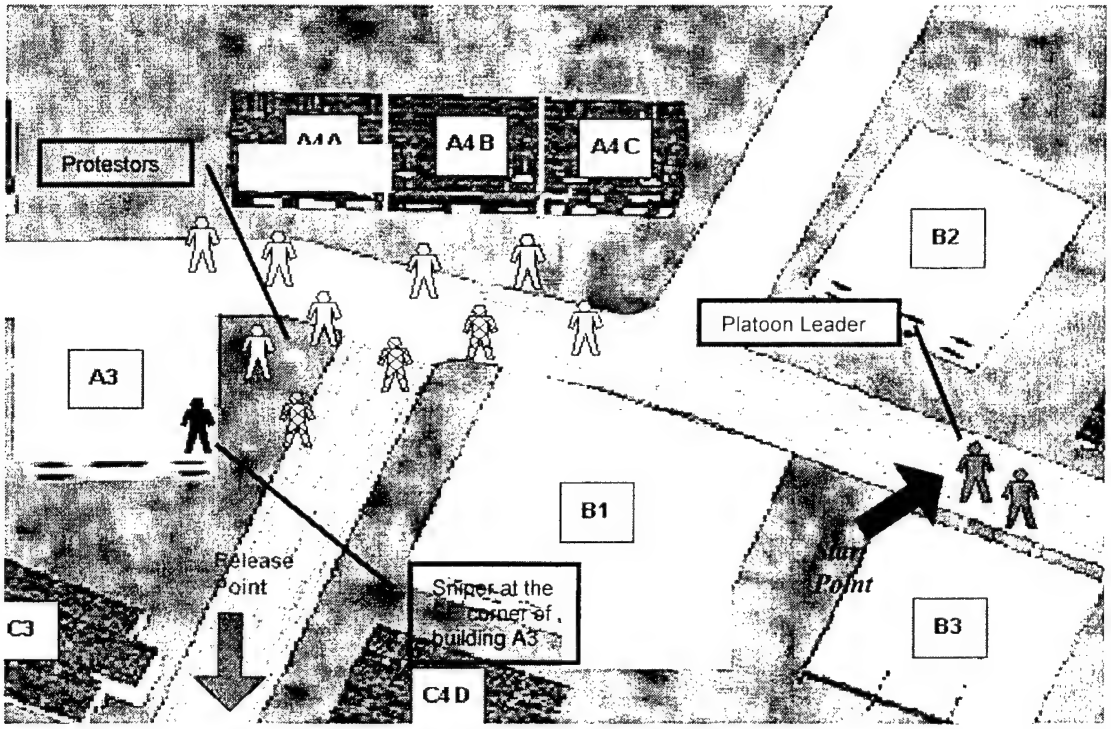
Sniper

Player	***Action***	***Location*** (ref. To Buildings)
1. Sniper (SAF)	Shooting 'wildly'	Southeast Corner of A3

Non-Combatants

Civilians

Player	***Action***	***Location*** (ref. To Buildings)
1. Adult (Entity)	Roving Freely	Between A3 and A4
2. Adult (Entity)	Roving Freely	Between A3 and A4
3. Adult (Entity)	Roving Freely	Between A3 and A4
4. Adult (Entity)	Roving Freely	Between A4 and B1
5. Adult (Entity)	Roving Freely	Between A4 and B1
6. Adult (Entity)	Roving Freely	Between A4 and B1
7. Adult (Entity)	Roving Freely	Between B1 and A3
8. Adult (Entity)	Laying Dead	Road North of B1
9. Adult (Entity)	Laying Dead	Between A3 and B1
10. Adult (Entity)	Laying Dead	Between A3 and B1



Representation of Deployment of Soldier, Entities and SAF's

Simulation Functionality

The trainee is responsible for coordinating the movement of the soldiers at his disposal. The movement and actions are limited and are dependent upon the BattleMaster. The trainee is required to verbally instruct Semi-Automated Forces (SAF) via the BattleMaster. Additional immersed trainees can replace SAF soldiers and will be instructed directly. The trainee will issue instructions by first identifying the soldier or unit and then describing the movement required, i.e. 'Soldier 2- follow me' or 'Soldier 2- follow me and cover our rear,' etc. SAF Soldiers will not relay intelligence.

Mission Event Stream

Preparation

The trainee is provided a graphical representation of the city (Training Aide 1). The trainee is verbally briefed with the *Mission Background, Setting, Mission Conditions* and *Simulation Functionality.*

Movement

The platoon leader will provide comprehensive instruction to his driver, via the BattleMaster. The BattleMaster will direct the driver (SAF) as if he were subordinate to the platoon leader.

The platoon leader and driver will be deployed to the road in front of building B3, as if they had exited a vehicle to investigate a disturbance. The platoon leader will hear gunfire and see several civilian protestors milling around building A3. The sniper will be stationed outside of building A3 at the southeast corner and will be primarily focused on the civilians and not the soldiers.

The platoon leader must first identify the sniper and begin to coordinate his tactical response. He will lead and deploy the driver into positions of tactical advantage to the sniper. The platoon leader and driver will eliminate the sniper.

Upon eliminating the sniper, the platoon leader and driver are to continue on their way to building C2, HQ. The mission will conclude upon the two arriving at HQ.

Staged Action

The audible gunfire and moving civilians are present to establish a sense of urgency for the platoon leaders to take action. There are three dead civilians; the sniper will only shoot other civilians when the platoon leader is able to see both the sniper and the intended civilian target.

Communication

The BattleMaster will act as the command element (operating remotely). The BattleMaster will also act as the driver. The BattleMaster will accept and respond to radio communications for each of them accordingly. The BattleMaster will respond to the communications as necessary, i.e. clarify instructions upon request or accept SITREP's, etc.

The platoon leader should be forthcoming with a SITREP upon discovering the dead civilians, locating the sniper and at any other notable event throughout the mission.

The BattleMaster will use discretion in coaxing the platoon leader through the mission to the release point, HQ.

Call Signs:

- Command Element -'Charlie Echo'
- Alpha Platoon Leader-'Papa Lima'
- Driver-'Delta 1'

Scripted Communications:

- Charlie Echo-"Papa Lima, this is Charlie Echo, SITREP."
  (Stated if the trainee fails to provide SITREP per mission requirements)

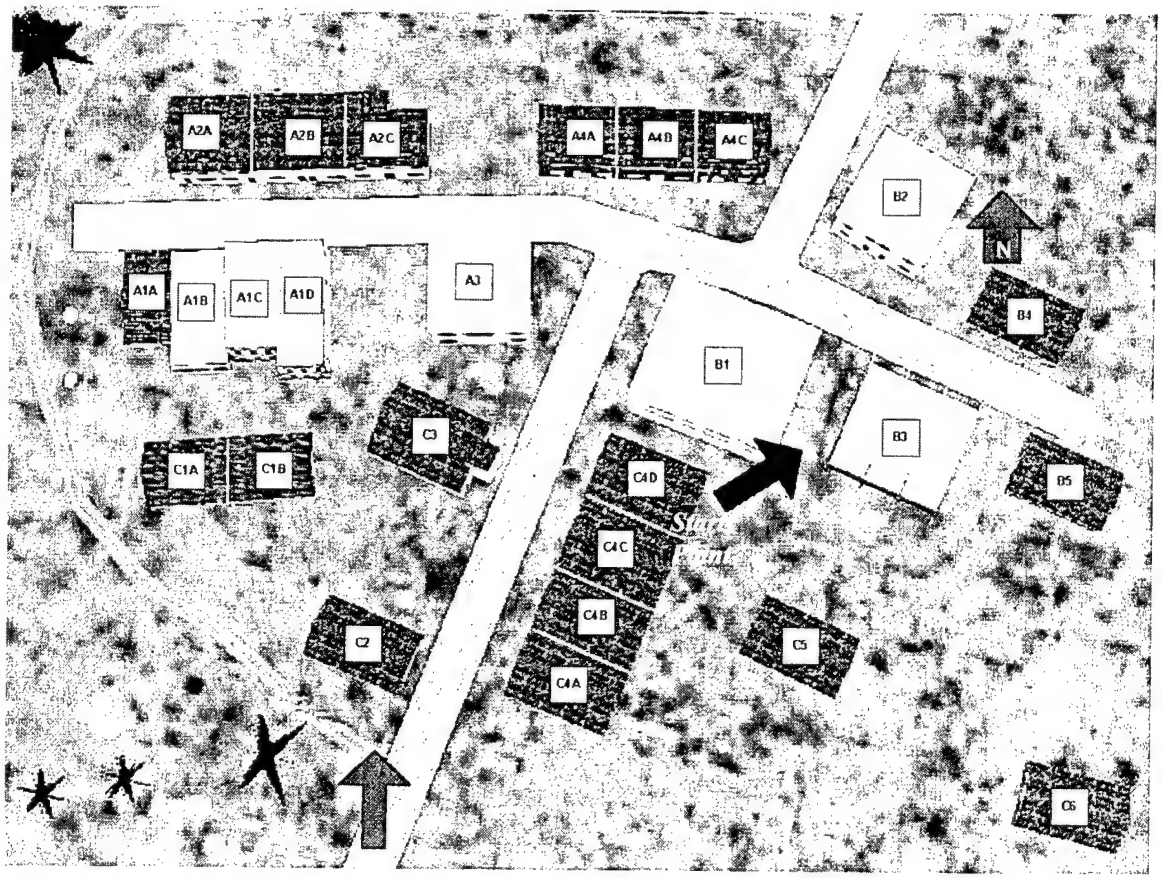
- Charlie Echo-"Papa Lima, this is Charlie Echo, investigate and see what you can do. Keep me informed. Out."

(Stated if the trainee initially asks for guidance upon discovering the situation, requests for reinforcements will be denied)

Termination of Training Mission

The trainer will provide the training participants a complete and thorough *After Action Review (AAR)* of their efforts during the mission. The AAR will include the presentation of the participants captured Decision Factors, via ViSSA. The AAR will be structured from the standpoint of the participants' efforts as associated with the adherence to the mission's Training/Learning Objective.

Training Aid 1
Mission Map of Terrain



Appendix G

Level 4 Training Mission: Hostage Rescue

Training/Learning Objective

The trainee will demonstrate his planning, judgment and leadership skills by coordinating the movement and responses of his soldiers throughout the simulation.

Mission Description

Task Force Rescue of U. N. Peace Keepers held hostage by terrorist faction.

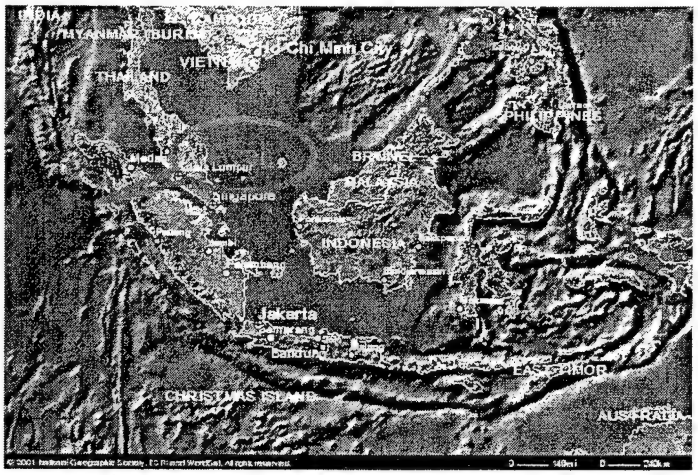
Mission Setting

Aceh, Indonesia (Population 3,500,000)

Mission Features

- Urban Terrain
- Low Intensity Conflict Requiring 'Surgical' Military Task Force Operations
- Restrictive Rules of Engagement
- Neutral and Resistant Multi-Cultural Citizenry
- Occupation by Multi-National UN Forces

Mission Background



Geographical Location of Aceh, Indonesia

Indonesia's government and infrastructure have fallen. The country's attempt to become a democracy has failed and has subsequently led to ethnic, religious and economic conflict. Tens of thousands have died as a result of tribal warfare and ethnic 'cleansing'. Strategic bombings by 'religious extremists' has also taken a toll on the once growing, but now struggling country. Starvation is the second leading cause of death in the region. Indonesia's neighboring countries have requested and been granted United Nations assistance in bringing the region under control. A U.N. Military force is assembled and dispatched to bring peace to the region.

The United States commits several infantry regiments, under the name 'Task Force Blue', to the U.N.'s 'Operation Safe Order'. Task Force Blue arrives and begins to provide support to the relief effort.

Mission Players

Alpha Platoon/Task Force Blue (19)

27. Platoon Leader	(Trainee)
28. Squad Leader	(Semi-Automated Force)
29. Fire Team Leader	(Semi-Automated Force)
30. Rifleman	(Semi-Automated Force)
31. Grenadier	(Semi-Automated Force)
32. SAW Gunner	(Semi-Automated Force)
33. Fire Team Leader	(Semi-Automated Force)
34. Rifleman	(Semi-Automated Force)
35. Grenadier	(Semi-Automated Force)
36. SAW Gunner	(Semi-Automated Force)
37. Squad Leader	(Semi-Automated Force)
38. Fire Team Leader	(Semi-Automated Force)
39. Rifleman	(Semi-Automated Force)
40. Grenadier	(Semi-Automated Force)
41. SAW Gunner	(Semi-Automated Force)
42. Fire Team Leader	(Semi-Automated Force)
43. Rifleman	(Semi-Automated Force)
44. Grenadier	(Semi-Automated Force)
45. SAW Gunner	(Semi-Automated Force)

Opposing Force (3)

2. Terrorist	(Semi-Automated Forces)
3. Terrorist	(Semi-Automated Forces)
4. Terrorist	(Semi-Automated Forces)

Non-Combatants (5)

29. U.N. Military Hostage	(Semi-Automated Force)
30. U.N. Military Hostage	(Semi-Automated Force)
31. Adult	(Automated Entity)
32. Adult	(Automated Entity)
5. Adult	(Automated Entity)

Mission Conditions

Situation
Two soldiers from the United Nations Multi-National Peace Keeping Force were taken captive within the last hour. An extremist terrorist faction in the region is holding the soldiers captive.

Enemy
The terrorist faction is considered to be extremely dangerous. They posses small arms and have been known to use explosives. Their size is unknown.

Terrain/Location
The U.N. soldiers are being held captive in one of several buildings at the center of the nearby city, Aceh. It is believed that the hostages are being held in either building A2 or A4. Aceh is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat).

Commanders Intent
The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region.

'Soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations.' *The Rules-of-Engagement (ROE)* are restrictive; 'the use of force is only justified in the direct defense of oneself or another' and 'no overt damage to the structures or disruption of the local services will be tolerated.' Casualties are not acceptable.

Organization
Two squads from Alpha Platoon, Task Force Blue.

Communication
A clear radio net has been established. Communication will be restricted. A *Situation Report (SITREP)* is expected at any notable event or when the mission has been accomplished.

Mission
Two squads of Alpha Platoon will be deployed south of building C4. From that point, the squads will attempt to locate the U.N. Soldiers and secure their safety. The squads will be assigned to locate, search, and clear buildings A2 and A4. The squads will search the buildings, locate the hostages, and eliminate the terrorists. The mission will be concluded upon the elimination of the terrorists, and a SITREP, stating such, provided to the command element.

Player Actions/Deployment

Soldiers

Player	***Action***	***Location*** (ref to Buildings)
Platoon Leader (Trainee)	Lead and Direct Squads	South of C4

1st Squad

Player	***Action***	***Location*** (ref to Buildings)
1. Squad Leader (SAF)	Respond to Platoon Leader	South of C4
2. Fire Team Leader (SAF)	Follow Team Leader	South of C4
3. Rifleman (SAF)	Follow Team Leader	South of C4
4. Grenadier (SAF)	Follow Team Leader	South of C4
5. SAW Gunner (SAF)	Follow Team Leader	South of C4
6. Fire Team Leader (SAF)	Follow Team Leader	South of C4
7. Rifleman (SAF)	Follow Team Leader	South of C4
8. Grenadier (SAF)	Follow Team Leader	South of C4
9. SAW Gunner (SAF)	Follow Team Leader	South of C4

2nd Squad

Player	***Action***	***Location*** (ref to Buildings)
1. Squad Leader (SAF)	Respond to Platoon Leader	South of C4
2. Fire Team Leader (SAF)	Follow Team Leader	South of C4
3. Rifleman (SAF)	Follow Team Leader	South of C4
4. Grenadier (SAF)	Follow Team Leader	South of C4
5. SAW Gunner (SAF)	Follow Team Leader	South of C4
6. Fire Team Leader (SAF)	Follow Team Leader	South of C4
7. Rifleman (SAF)	Follow Team Leader	South of C4
8. Grenadier (SAF)	Follow Team Leader	South of C4
9. SAW Gunner (SAF)	Follow Team Leader	South of C4

Opposing Forces

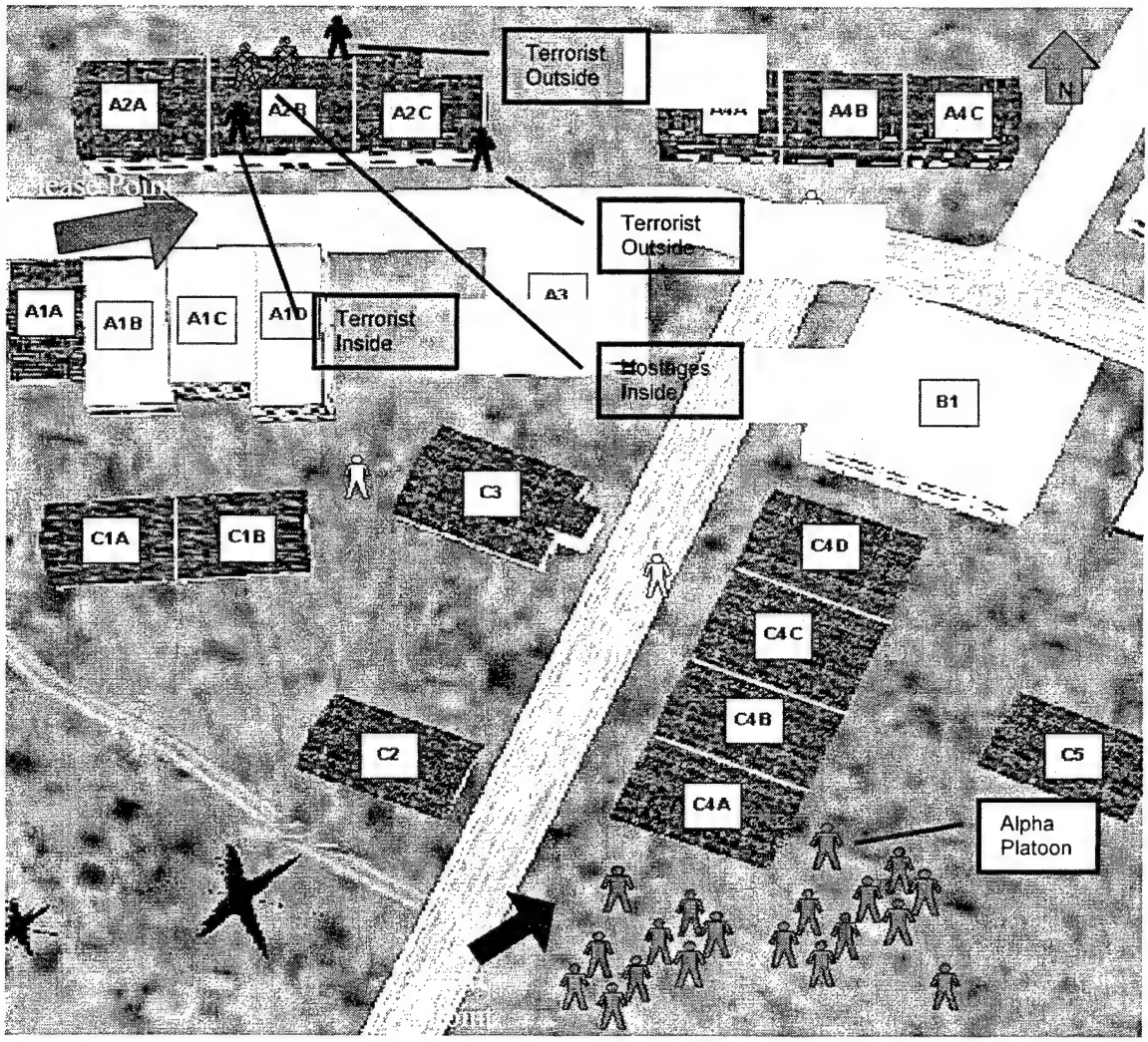
Terrorists

Player	***Action***	***Location*** (ref. To Buildings)
1. Terrorist	Shoot at Squads	Inside A2C at Southeast window
2. Terrorist	Shoot at Squads	Outside A2B at Northeast corner
3. Terrorist	Shoot at Squads, Guard U.N. Soldiers	Stage near U.N. Soldiers, Inside A2B

Non-Combatants

Non-Combatants

Player	***Action***	***Location*** (ref. To Buildings)
1. U.N.Military Hostage (SAF)	Stationary Position	Inside A2B
2. U.N.Military Hostage (SAF)	Stationary Position	Inside A2B
3. Adult (Entity)	Roving Freely	Between C1 and C3
4. Adult (Entity)	Roving Freely	Between B1 and A4
5. Adult (Entity)	Roving Freely	Between C4 and C3



Representation of Deployment

Simulation Functionality

The trainee is responsible for coordinating the movement of the soldiers at his disposal. The movement and actions are limited and are dependent upon the BattleMaster. The trainee is required to verbally instruct Semi-Automated Forces (SAF) via the BattleMaster. Additional immersed trainees can replace SAF soldiers and will be instructed directly. The trainee will issue instructions by first identifying the soldier or unit and then describing the movement required, i.e. 'Soldier 2- follow me, Soldier 3, 4 and 5 cover the rear.' SAF Soldiers will not relay intelligence.

Training and Mission Event Stream

Preparation

The trainee is verbally briefed with the *Mission Background, Setting* and *Simulation Functionality.* The trainee will be issued Training Aid 1, Operations Order and Training Aid 2, Mission Map of Terrain. In the event that additional trainees are included in the mission, they will assume the roles as squad leaders and will be given a verbal brief by the platoon leader before deployment.

Movement

The platoon leader will provide comprehensive instruction to the squad leaders, via the BattleMaster. The BattleMaster will direct the squad leaders and the squad members (SAF) as if they are subordinates to the platoon leader.

The platoon leader and squads will be deployed south of building C4. From that point, the platoon leader will direct the squads to the assigned buildings, A2 and A4. There, the platoon leader will direct the squads search and domination of the buildings. The mission will conclude upon the elimination of the terrorists.

Staged Action

The BattleMaster will direct the terrorists to shoot the assaulting soldiers of Alpha Platoon.

Communication

The BattleMaster will act as the command element (operating remotely). The BattleMaster will also act as the squad leaders. The BattleMaster will accept and respond to radio communications for each of them accordingly. The BattleMaster will respond to the communications as necessary, i.e. clarify instructions upon request or accept SITREP's, etc.

Communications are restricted however a SITREP is expected from the platoon leader upon coming under fire, locating the hostages or eliminating the terrorists.

- Call Signs:

    - Command Element- 'Charlie Echo'
    - Alpha Platoon Leader- 'Papa Lima'
    - 1st Squad- 'Alpha 1'
    - 2nd Squad- 'Alpha 2'

- Scripted Communications:

  There will be no scripted communications during this mission. The platoon leader is expected to accomplish the mission with the resources and soldiers provided. The BattleMaster will use his discretion upon initiating or responding to any communication from the platoon leader.

Termination of Training Mission

The trainer will provide the training participants a complete and thorough *After Action Review (AAR)* of their efforts during the mission. The AAR will include the presentation of the participants captured Decision Factors, via ViSSA. The AAR will be structured from the standpoint of the participants' efforts as associated with the adherence to the mission's Training/Learning Objective.

Training Aid 1
Operations Order (OPORD)

Situation
Two soldiers from the United Nations Multi-National Peace Keeping Force were taken captive within the last hour. An extremist terrorist faction in the region is holding the soldiers captive.

Enemy
The terrorist faction is considered to be extremely dangerous. They posses small arms and have been known to use explosives. Their size is unknown.

Terrain/Location
The U.N. soldiers are being held captive in one of several buildings at the center of the nearby city, Aceh. It is believed that the hostages are being held in either building A2 or A4. Aceh is classified as 'Type B' Urban Terrain, Closed-Orderly Block construction (as defined by FM 90-10-1, An Infantryman's Guide to Modern Urban Combat)

Commanders Intent
The objective of the 'Operation Safe Order', in Indonesia, is to restore order and safety throughout the region.

'Soldiers of Task Force Blue will act with speed, stealth and good judgment in all facets of operations.' *The Rules-of-Engagement (ROE)* are restrictive; 'the use of force is only justified in the direct defense of oneself or another' and 'no overt damage to the structures or disruption of the local services will be tolerated.' Casualties are not acceptable.

Organization
Two squads from Alpha Platoon, Task Force Blue

Communication
A clear radio net has been established. Communication will be restricted. A *Situation Report (SITREP)* is expected at any notable event or when the mission has been accomplished.

Mission
Two squads of Alpha Platoon will be deployed south of building C4. From that point, the squads will attempt to locate the U.N. soldiers and secure their safety. The squads will be assigned to locate, search, and clear buildings A2 and A4. The squads will search the buildings, locate the hostages, and eliminate the terrorists. The mission will be concluded upon the elimination of the terrorists and a SITREP, stating such, provided to the command element.

Training Aid 2
Mission Map of Terrain